NOVA SCOTIA OIL AND GAS REPORT 1987

Nova Scotia

Department of Mines and Energy

Honourable Joel R. Matheson, Q.C.
Minister

John J. Laffin, P.Eng.
Deputy Minister

Cover Photo:
The first shipment of crude oil from Canada's east coast being pumped from Gorilla 1 into a tanker during a six-day production test on the Panuke F-99 well off Nova Scotia. Photo courtesy Petro-Canada.

MINISTER'S MESSAGE

Honourable Joel R. Matheson, Q.C.

It is again my pleasure to report on oil and gas exploration activities in Nova Scotia during the past year.

Since the last Oil and Gas Report was published, we experienced a lull in offshore activity which lasted until the spring of 1987. Since that time three wells have been spudded. This general downturn in activity was mirrored in all other oil and gas producing areas of the world and reflected general uncertainty regarding world oil prices. As I write, prices for benchmark crudes have moved above U.S. $20 per barrel, a level many predicted would not be seen until the 1990's. Stable prices in this range give reason for optimism that the future level of exploration activity in our offshore will also stabilize at four to six wells per year.

Despite the price uncertainty, the past year was not without its accomplishments. In May 1987, the Nova Scotia Legislature approved a package of legislation to enable the implementation of the Canada-Nova Scotia Offshore Petroleum Resources Accord which was signed in August 1986. The federal government has introduced a similar package of legislation to the Parliament of Canada.

The Accord provides Nova Scotia with several significant improvements over the 1982 Offshore Agreement it supersedes — it puts the Province on an equal footing with the federal government in the management of the offshore resources and gives Nova Scotia full control over provincial-type revenues such as royalties.

Progress is also being made on the establishment of a new Canada-Nova Scotia Offshore Oil and Gas Board.

In spite of the temporary lull in offshore drilling activity, there were some very successful and promising drilling results recorded in the fall of 1986 and early summer 1987.

The Glenelg structure was successfully delineated with the drilling of the Glenelg N-49 well. The third Thebaud delineation well was successfully completed, flowing significant quantities of gas. A significant oil discovery was made at the Panuke field, which was successfully delineated with the recent drilling of the Panuke F-99 well. This well was extensively tested during July-August 1987, producing large quantities of high quality, light crude oil which was collected in a tanker and shipped to a Montreal refinery for processing.

Early in 1986 the federal and provincial governments requested industry to nominate lands they wished to be made available for exploration. Based upon nominations submitted by industry, four parcels of land in the Sable Island area were offered for bid and, in November 1986, the Canada-Nova Scotia Offshore Oil and Gas Board announced the award of an exploration agreement for a block of land adjacent to the Panuke discovery to a group of companies headed by Petro-Canada.

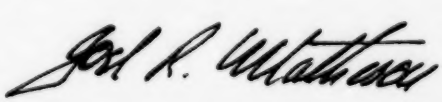
A more flexible land posting policy has now been adopted which will allow companies to nominate open lands at any time. The Board is currently accepting nominations of open land to be considered in future calls for bids.

As you will gather, we have tried to take advantage of the lull in activity to put in place a regulatory regime which will stand us in good stead when development does begin.

Turning to onshore events, during the past year three onshore exploration agreements were renewed and a new one concluded for lands in the Kennetcook-Noel Shore area of Hants County. A seismic program was conducted on these lands.

In conclusion, the past year has taught us a great deal about the vagaries of the market for an internationally traded commodity and how activity close to home can be affected by events on the other side of the world. Our offshore resource is nonetheless a considerable one, can be put into production using proven technology and is close to large markets. We also have the added attraction of a secure supply due to our stable political and social environment.

I am convinced that, for these reasons and others, our resource is a valuable one to both Canadians and our neighbours to the South. The Government of Nova Scotia firmly believes that development of and production from our offshore fields is only a matter of time.



Joel R. Matheson, Q.C., Minister

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Production test on the Cohasset oilfield. Photo: Gordon A. Murray.

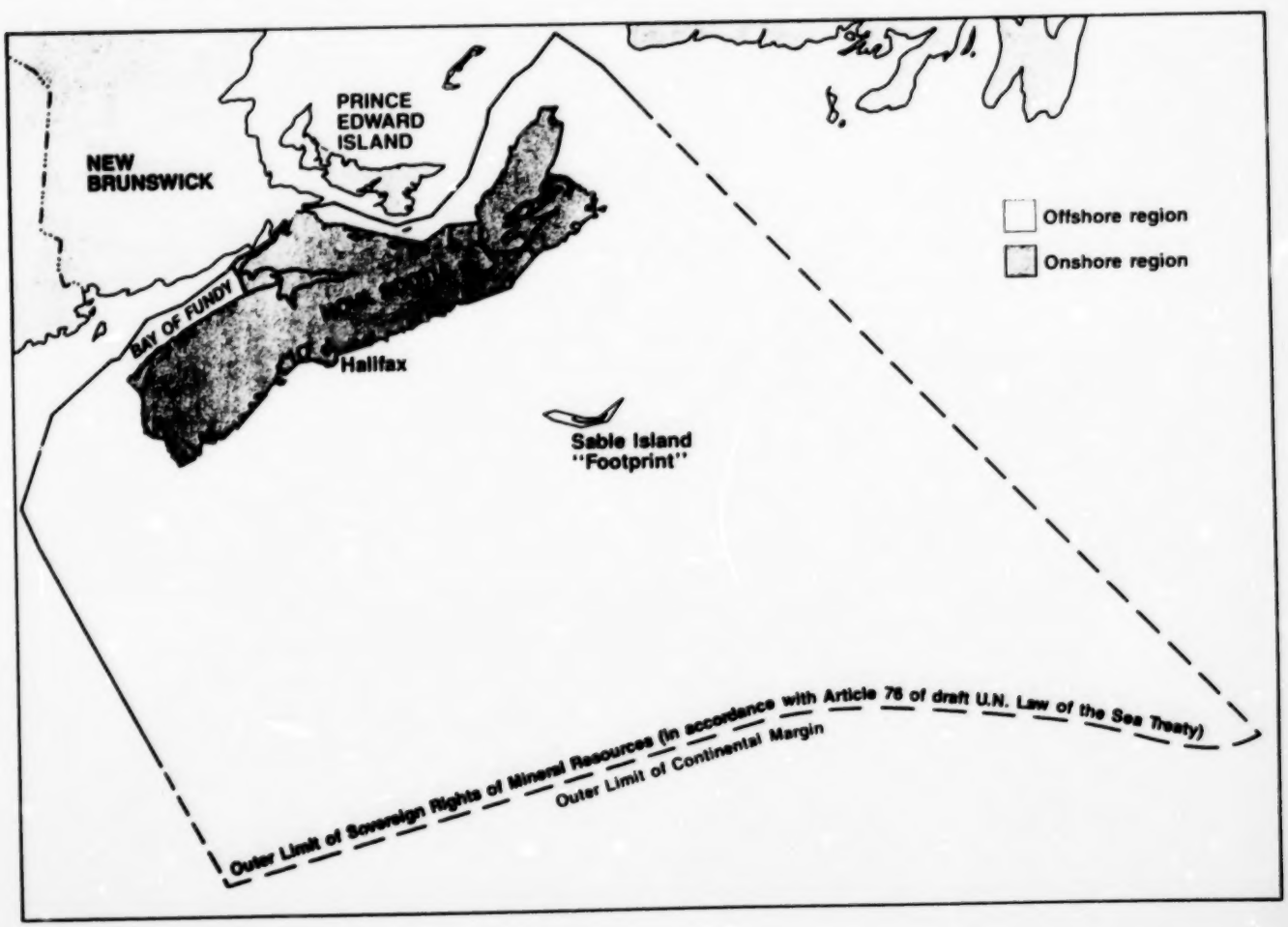
OIL AND GAS
EXPLORATION
AND DEVELOPMENT

1 INTRODUCTION

For administrative purposes, oil and gas activity in Nova Scotia is divided according to whether it occurs in the offshore or onshore regions (Figure 1). The offshore region is being administered jointly by the Governments of Nova Scotia and Canada under the provisions of the Canada-Nova Scotia Offshore Petroleum Resources Accord, while the onshore region is administered by the provincial government alone.

Figure 1

Nova Scotia Offshore and Onshore Regions


PRINCE EDWARD ISLAND
NEW BRUNSWICK
BAY OF FUNDY
Halifax
Sable Island "Footprint"
Offshore region
Onshore region
Outer Limit of Sovereign Rights of Mineral Resources (in accordance with Article 76 of draft U.N. Law of the Sea Treaty)
Outer Limit of Continental Margin

2 OFFSHORE REGIONS

THE CANADA-NOVA SCOTIA OFFSHORE PETROLEUM RESOURCES ACCORD

A wide ranging federal-provincial agreement on resource management and revenue sharing in the offshore, the Canada-Nova Scotia Offshore Petroleum Resources Accord, was signed on August 26, 1986, by Prime Minister Brian Mulroney, Premier John Buchanan, the Honourable Marcel Masse, the federal Minister of Energy, Mines and Resources, and the Honourable Joel Matheson, Nova Scotia Minister of Mines and Energy. The Accord replaces and contains significant improvements to the March 1982, Canada-Nova Scotia Agreement on Offshore Oil and Gas Resource Management and Revenue Sharing. Legislation to implement the Accord has subsequently been introduced both in the Parliament of Canada and in the Nova Scotia Legislature. The most important aspects of the Accord involve resource and fiscal management and are described below:

1. Resource Management — A new independent board will replace the existing Canada-Nova Scotia Offshore Oil and Gas Board, ensuring joint federal-provincial management of the offshore. The Board will deal with matters directly related to the management of offshore petroleum resources, and will have an office and staff located in Nova Scotia. It will also take over the activities of the Canada Oil and Gas Lands Administration (COGLA) where they relate to offshore Nova Scotia.

The new Board will have five members including a chairman appointed jointly by both governments. The other members may be appointed jointly, or each goverment may appoint two members. No more than two members of the Board may be federal or provincial public servants.

The Canada-Nova Scotia Offshore Oil and Gas Board will be responsible for decisions such as:

- declaring significant discoveries;
- regulating good oilfield practices;
- exercising emergency powers;
- approving technical aspects of development plans;
- collecting royalties;
- public review of matters within its mandate; and
- making recommendations with respect to proposed amendments to the legislation and regulations under the Accord.

Certain Board decisions are considered fundamental and will be subject to the approval of the two governments. These include:

- Calls for Bids and the issuing of exploration licences following a Call for Bids;
- setting terms and conditions of significant discovery licences and production licences;
- final approval of development plans.

Within the Sable Island "footprint" and the Bay of Fundy, these fundamental decisions will be approved by the Nova Scotia Minister of Mines and Energy alone. In the remainder of the Nova Scotia offshore region, development plan approval would be by the Nova Scotia Minister alone, but all other fundamental decisions would be approved jointly by the federal and Nova Scotia energy ministers.

In turn, the federal energy minister may act unilaterally to override Board decisions or the provincial minister's veto, if in the opinion of the federal minister, the decision or veto unreasonably delays the achievement of security of supply of crude oil as defined in the Accord. In the case of disagreement between ministers on the question of delay of security of supply, the matter will be decided by the National Energy Board.

The Accord acknowledges that Nova Scotia will have an equivalent status to other producing provinces, in negotiations and consultations with the Government of Canada in all matters affecting petroleum resources in the offshore area.

2. Fiscal Matters — Under the terms of the Canada-Nova Scotia Offshore Petroleum Resources Accord, Nova Scotia has the authority to establish and administer resource revenues as if the oil and gas resources were located on the land portion of Nova Scotia. The revenues that the Province will receive include:

- royalties;
- provincial corporate income tax;

- sales tax;
- bonus payments;
- rentals and licence fees; and
- other forms of revenue of a provincial nature and other taxes which may be established.

The Government of Canada will receive:

- federal corporate income taxes; and
- other revenue of a federal nature and other taxes which may be established under federal law.

The equalization provisions of the 1982 Agreement have been incorporated into the Accord, to ensure that equalization payments will not decrease dollar for dollar as a result of offshore revenues. The 1982 provision, allowing the Province to take up to a 50 per cent interest in offshore pipelines and their onshore extensions, has also been retained.

Other fiscal provisions of the Accord include:

- Arrangements for the Province to receive Crown Share Adjustment payments from Canada. This provision confers financial benefits the Province would have enjoyed had it acquired a portion of the Crown Share, as provided for in the 1982 Agreement, without the risk associated with an actual acquisition.
- The $200 million Development Fund in the 1982 Agreement will be converted from a loan to a grant.
- Canada will make available a $25 million grant to Nova Scotia Resources Ltd., a provincial Crown corporation established to develop Nova Scotia's oil and gas resources, to assist it in exploration and oil and gas developments offshore.

The Accord also deals with other matters including: Nova Scotia benefits, public review of prospective developments, provincial access to offshore production, environmental protection and constitutional entrenchment.

OFFSHORE PETROLEUM ROYALTIES

The basic elements of Nova Scotia's Offshore Petroleum Royalty Regime were announced in 1987. Nova Scotia's objective in designing the royalty regime was to create a system which would help produce an attractive rate of return, adequate cash flow, and fiscal stability for industry investors, while ensuring Nova Scotia a fair economic return and encouraging recovery of marginally economic reserves. Based on these objectives, the following royalties for the offshore were developed:

Before Project Payout

. A base royalty equal to 2 per cent of gross wellhead revenues and

After Project Payout

. A royalty equal to 30 per cent of net profits before tax with the minimum royalty equal to the base royalty.

Project payout is the date on which cumulative gross revenue equals the sum of eligible capital costs, operating costs, royalties paid, and cumulative return allowance. Eligible capital costs are specified exploration and development costs within the project boundary. The return allowance is calculated each year using a percentage of those costs which have yet to be recovered from project revenues. The percentage equals the rate of long-term Government of Canada bonds plus 10 per cent. This represents the minimum, risk-adjusted rate of return required by investors in an offshore project.

This system, which includes fixed-share and profit-sharing royalties, recognizes the right of the Crown to a share of production, as owner of the resource, yet is sensitive to the need for project profitability. At the same time the royalties take into account the unique characteristics of offshore development, which requires long lead times for exploration, delineation, and construction, during which no revenue is generated. Because of high technical and financial risks, it is important that capital costs be recovered as quickly as possible from revenues. The royalty is thus minimal during early production and at a maximum when the capital invested has been recovered from the project by its sponsors. Overall, the royalty regime encourages development, while providing a fair share of offshore production revenues to the people of Nova Scotia.

3 ONSHORE REGIONS

PETROLEUM RESOURCES ACT

The Petroleum Resources Act was proclaimed on July 28, 1984, and established the legislative regime for exploration and production of petroleum, including oil, natural gas, and coal gas, in the onshore area of Nova Scotia. The onshore area includes all of the Province except those lands subject to the Canada-Nova Scotia Offshore Petroleum Resources Accord.

The Act provides for three types of agreements in connection with exploration and production:

Exploration License — Grants a non-exclusive right to explore for petroleum. An exploration license has a term of one year and is intended to allow preliminary exploration to delineate areas of potential. The licensee may not drill a well deeper that 295 feet (90 m) and does not have the right to produce petroleum.

Exploration Agreement — Confers the exclusive right to explore for petroleum and the exclusive right to apply for a production lease for specified lands. An exploration agreement is usually issued after a Call for Proposals has been held, and has a 3-year term. It permits the agreement holder to drill deep test wells and to produce petroleum for test purposes. Annual rentals are $0.05 per acre ($0.12/ha).

Production Lease — If a commercial discovery is made and the explorer submits a development plan acceptable to the Minister of Mines and Energy, a production lease will be issued for an initial term of 10 years. A production lease grants the lessee the right to produce petroleum from the leased area and to market it in accordance with regulations. All petroleum marketed is subject to a 10 per cent royalty payable to the Province. As an incentive to encourage development, the first lease granted from any exploration agreement however is exempt from this royalty for the first two years.

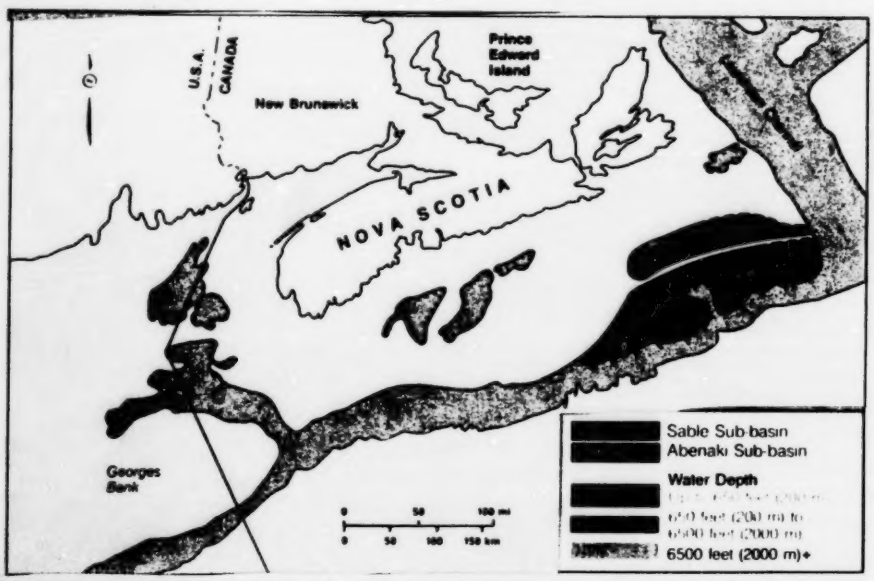
1 GEOLOGY

PHYSIOGRAPHIC FEATURES

The Nova Scotia offshore covers approximately 100 million acres (40 million hectares [ha]) and includes both the Scotian Shelf and the Scotian Slope, which together form part of the continental margin of eastern Canada. The margin is composed of three distinct parts: the Continental Shelf, which gently tilts away from the coast for approximately 150 miles (240 km) in water depths of up to 1,300 feet (400 m); the Continental Slope, a much narrower zone where water depths increase fairly rapidly to 8,200 feet (2 500 m); and the Continental Rise, the narrow band of transition between the slope and the deep ocean basin marking the outer edge of the continental margin.

Figure 2

Offshore Physiographic Features



The areas of greatest interest for oil and gas exploration are the Scotian Shelf and Scotian Slope. The Scotian Shelf is one of Canada's largest sedimentary basins, consisting of about 40 million acres (16 million ha), stretching for 435 miles (700 km) from Georges Bank in the west to the Laurentian Channel in the east, and ranging in width from 76 to 142 miles (122 to 228 km). Thick accumulations of sedimentary rock capable of producing hydrocarbons are found throughout the Scotian Shelf. The greatest thickness of sediments occurs in the Sable Subbasin (Figure 2) where the majority of oil and gas discoveries have been made.

Sable Island Bank is a central feature of the Scotian Shelf, extending 160 miles (260 km) east-west and 50 miles (80 km) north-south, and containing Sable Island, a 20-mile (32-km) crescent of sand. Seventy wells have been drilled in the Sable Sub-basin (out of a total of 123 wells on the Scotian Shelf and Scotian Slope), including nine wells drilled on Sable Island itself.

Formations deposited during the Jurassic and Cretaceous periods, 195 to 65 million years ago (Figure 3), are central to the hydrocarbon potential of the Scotian Shelf, and the Sable Island area in particular. These sediments were laid down in stages, beginning with a thick layer of salt in a rift basin formed as the North American continent separated from the North African land mass in Early Jurassic time. The salt, subsequently buried under (now) overlying rocks, flowed upward to form pillows, domes, and diapirs that underlie many of the present hydrocarbon bearing structures.

Carbonate banks, formed later in Jurassic time, produced thick deposits of limestone. The limestones, which include the important Baccaro carbonate front, found along the edge of the Scotian Shelf contain potential hydrocarbon reservoirs.

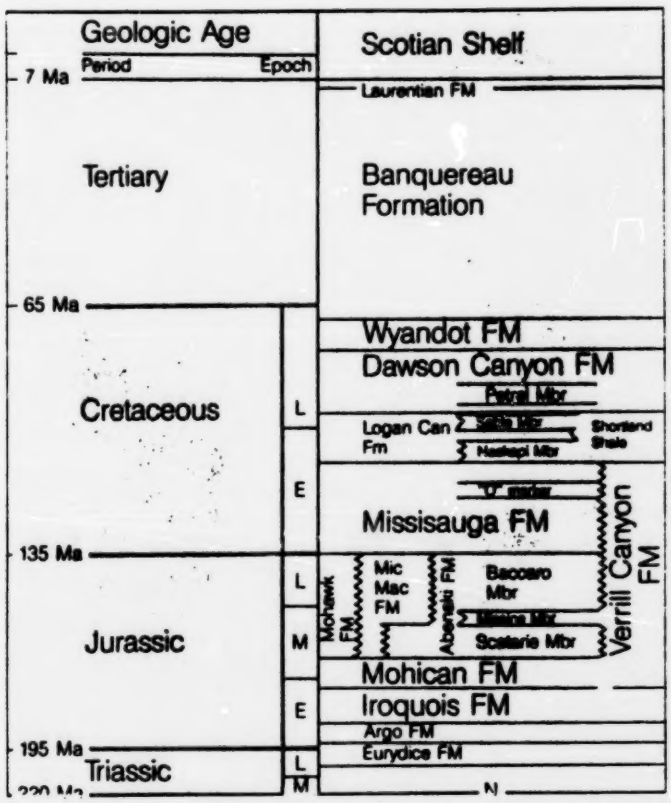
Throughout the Cretaceous, a series of coarse clastic sandstones, known as the Missisauga Formation, were deposited over the shelf margin and the Baccaro carbonate front. Seaward of this front, the coarse sands gradually became interbedded with, and finally were replaced by, shale. During the burial of the carbonate by sandstone and shale, a series of subsea deltas formed across the Scotian Shelf. The sea drowned out the deltas in Late Cretaceous time, covering them with shale.

The deltas and their associated thick sandstones have been a major factor in the accumulation of oil and gas on the Scotian Shelf. Shale and sandstone deposited as alternate layers

provided both source and reservoir rocks. Thick organic-rich sediments, formed from the load swept in by river systems that formed the deltas, were buried deep enough to generate hydrocarbons. Deep salt layers and/or basement block configuration and faults contributed the necessary relief and trapping mechanisms for the formation of oil and gas fields in these areas. The Sable Sub-basin and Abenaki Sub-basin were centers of maximum deposition of sediment. Most of the major hydrocarbon finds to date occur near centers of maximum deposition in these areas.

Figure 3

Stratigraphic Diagram of Lithologic Units



Ma Millions of years before present

L Late

M Middle

E Early

FM Formation

Mbr Member

RESERVOIRS AND TRAPS

Hydrocarbons have been found in reservoirs ranging in age from Late Cretaceous to Early Jurassic time. The most consistent and successful oil and gas discoveries have been related to down-to-basin structural faults that extend through the Sable Sub-basin. The fault system parallels and is seaward of the Baccaro carbonate front. Gas-producing zones have been discovered in interbedded sandstones and shales of Late Jurassic and Early Cretaceous age in the MicMac and Missisauga Formations. These sands are often overpressured and many wells in the area have encountered such overpressured sands (Figure 4). There has been a strong interest in finding overpressured reservoirs because they typically have high flow rates due, in part, to higher than normal porosities.

Overpressured reservoirs are typically deep — 15,000+ feet (4 572+ m). The additional drilling required to reach them and the specialized high pressure equipment used on the rig to deal with pressures in the range of 12,000-15,000 psi (83 000 - 103 000 kPa) make them expensive to drill. Overpressured reservoirs have attracted particular attention in past years as a result of blowouts at the Uniacke G-72 well in May 1983 and at West Venture N-91 in September 1984. In fact, the first well drilled offshore Nova Scotia, Mobil's Sable Island C-67, experienced a kick from an overpressured reservoir at the well's final depth of 15,106 feet (4 604 m).

More recently, drilling has been directed at shallower reservoirs of more normal pressure, reflecting industry's attempt to discover additional reserves but at decreased cost.

A new exploration fairway has developed south of Sable Island where the Alma, Glenelg, North Triumph, and Chebucto fields have been drilled. The Cretaceous age sands in the area show promise of productive reservoirs which could add additional reserves to the previously

discovered fields at Venture, Thebaud, and South Venture, and thus contribute to a commercially viable project. The most recent drilling targets have been oil accumulations along the Cohasset-Panuke trend. The oil is a light crude (ranging from 48 - 56° API) and requires less refining than conventional crude (35 - 40° API). Such oils occurring at shallow depths 7,050-7,875 feet (2 150 - 2 400 m) may be the focus of early development.

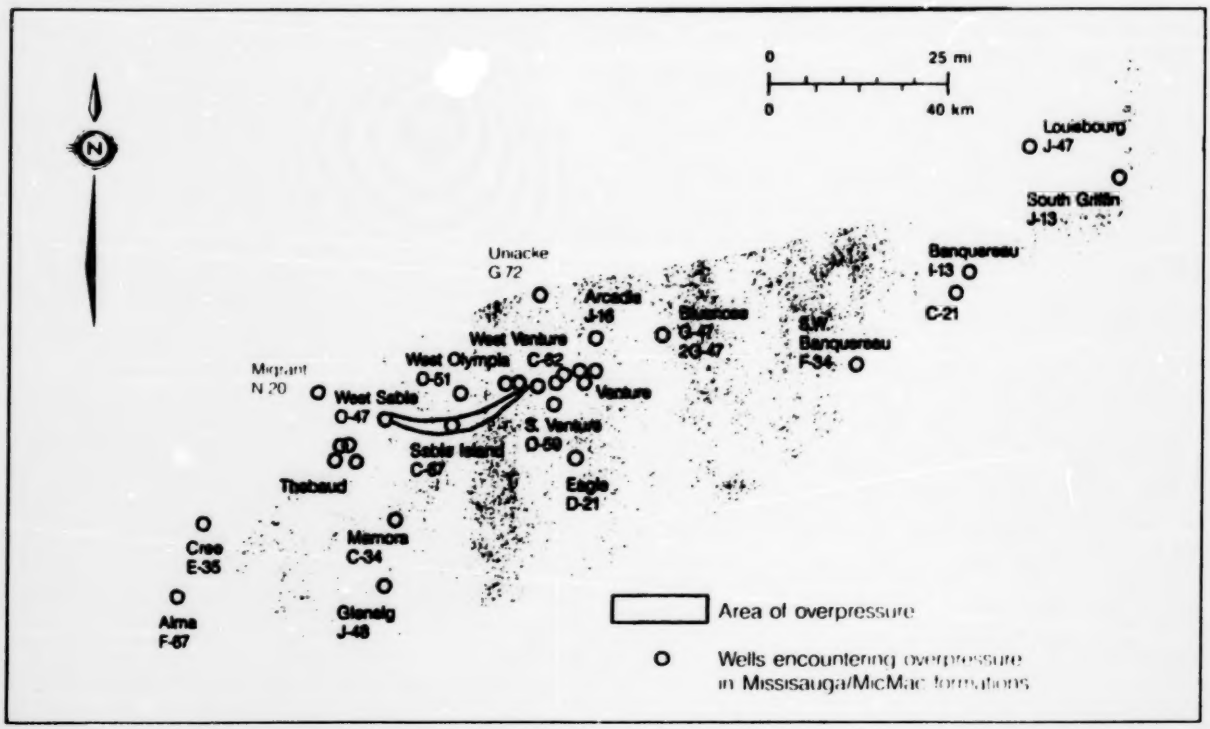
Hydrocarbons have also been found associated with salt dome structures that underlie much of the Sable Island area. These structures have proven to be severely faulted, however, and, as a result, hydrocarbon distribution is complex. Many such structures were identified during drilling in the 1970's.

A search for turbidite fans, deposits having similar characteristics to deltas and formed by slumping along the slope, has been pursued along the deep water areas of the Scotian Slope. In some areas of the world, such deposits have been prolific producers.

As the understanding of the geology of offshore Nova Scotia matures and drilling technology advances, new areas and new drilling targets will undoubtedly be identified.

Figure 4

Wells Encountering Overpressured Formations in the Sable Island Area



2 MANAGEMENT OF OFFSHORE LANDS

HIGHLIGHTS

Many significant events involving Nova Scotia's offshore lands have occurred since the signing of the Canada-Nova Scotia Offshore Agreement on Oil and Gas Resource Management and Revenue Sharing on March 2, 1982. Highlights of key land activities during the past five years are as follows:

1982 In March 1982, the Canada-Nova Scotia Offshore Oil and Gas Board was established to manage oil and gas resource activity off the coast of Nova Scotia. Oil companies formerly holding provincial licenses or federal leases began negotiating exploration agreements with the newly established Board.

1983 The first well under the new exploration agreement regime, West Esperanto B-78, was drilled in May 1983. Subsequently, approximately 40 exploration and delineation wells were drilled.

1984 May 1984, brought the conclusion of negotiations with oil and gas companies for 35 first-round exploration agreements calling for 46 wells to be drilled by 1988. In July, the Canada-Nova Scotia Offshore Agreement on Offshore Oil and Gas Resource Management and Revenue Sharing was proclaimed in legislation by the Governments of Nova Scotia and Canada. Later that year, in October, the World Court rendered a decision on the Canada/U.S. boundary line in the Gulf of Maine. The decision opened the possibility of exploratory drilling on the Canadian portion of Georges Bank.

1985 In April 1985, the first new offshore lands since 1982 were awarded to two exploration groups, one led by Canterra Energy and the other by Husky Oil. In December, negotiations were finalized on the first second-round exploration agreements.

1986 In February 1986, the Canada-Nova Scotia Offshore Oil and Gas Board issued a Call for Nominations. In June 1986, the Board issued a Call for Proposals which gave industry an opportunity to bid competitively on the nominated lands. Following receipt of bids, an exploration agreement was signed in November 1986.

The Canada-Nova Scotia Offshore Petroleum Resources Accord was signed in August 1986. The Accord gives Nova Scotia increased input into the management of offshore oil and gas exploration and development, including control over revenues from offshore resources as if they were onshore.

1987 In May 1987, an Act to implement the Canada-Nova Scotia Offshore Petroleum Resources Accord was passed by the Nova Scotia Legislature and will be proclaimed once the mirror legislation is passed in Parliament. The Act will create a new Canada-Nova Scotia Offshore Oil and Gas Board.

EXPLORATION AGREEMENTS

In June 1986, the Canada-Nova Scotia Offshore Oil and Gas Board issued Call for Proposals 86NS-1, which made available four parcels of land, nominated by industry, in the Sable Island area. Proposals arising from the Call for Proposals were evaluated and, in November 1986, the Board announced the award of Exploration Agreement 300 to a group of companies headed by Petro-Canada. The group's successful bid of $1,085,000 on a 22,992-acre (9 305-ha) block adjacent to the Panuke oil discovery offered the highest work expenditure (the amount a bidder is committed to spend on the lands).

During the past year, two first-round exploration agreements reached the end of their terms and were successfully renegotiated into second-round exploration agreements, each with a 3-year term. One of these renegotiated exploration agreements, Mobil's Sable Island block, requires that two wells be spudded prior to the end of the second year of the term (September 1988). Three previously negotiated second-round exploration agreements were surrendered. Current exploration agreements are shown in Figure 5.

The Board is currently accepting nominations for open Crown lands to be considered in future Calls for Proposals. The following terms and conditions will apply to exploration agreements issued as a result of any future Calls:

- terms of six years for Shelf lands and eight years for Slope lands, each divided into two consecutive periods of three years for the Shelf and four years for the Slope;
- a requirement for drilling at least one well during the first period to validate the agreement for the second period;
- no interim relinquishment requirement;
- no annual rental fees during the initial period;
- rentals in the second period according to Table 1;
- a deposit amounting to 25 per cent of the Work Expenditure Bid, refundable against allowable expenditures incurred during the first period; and
- the right of companies to retain only significant discoveries at the end of the renewal term.

Figure 5

Lands Held by Exploration Companies, June 1987

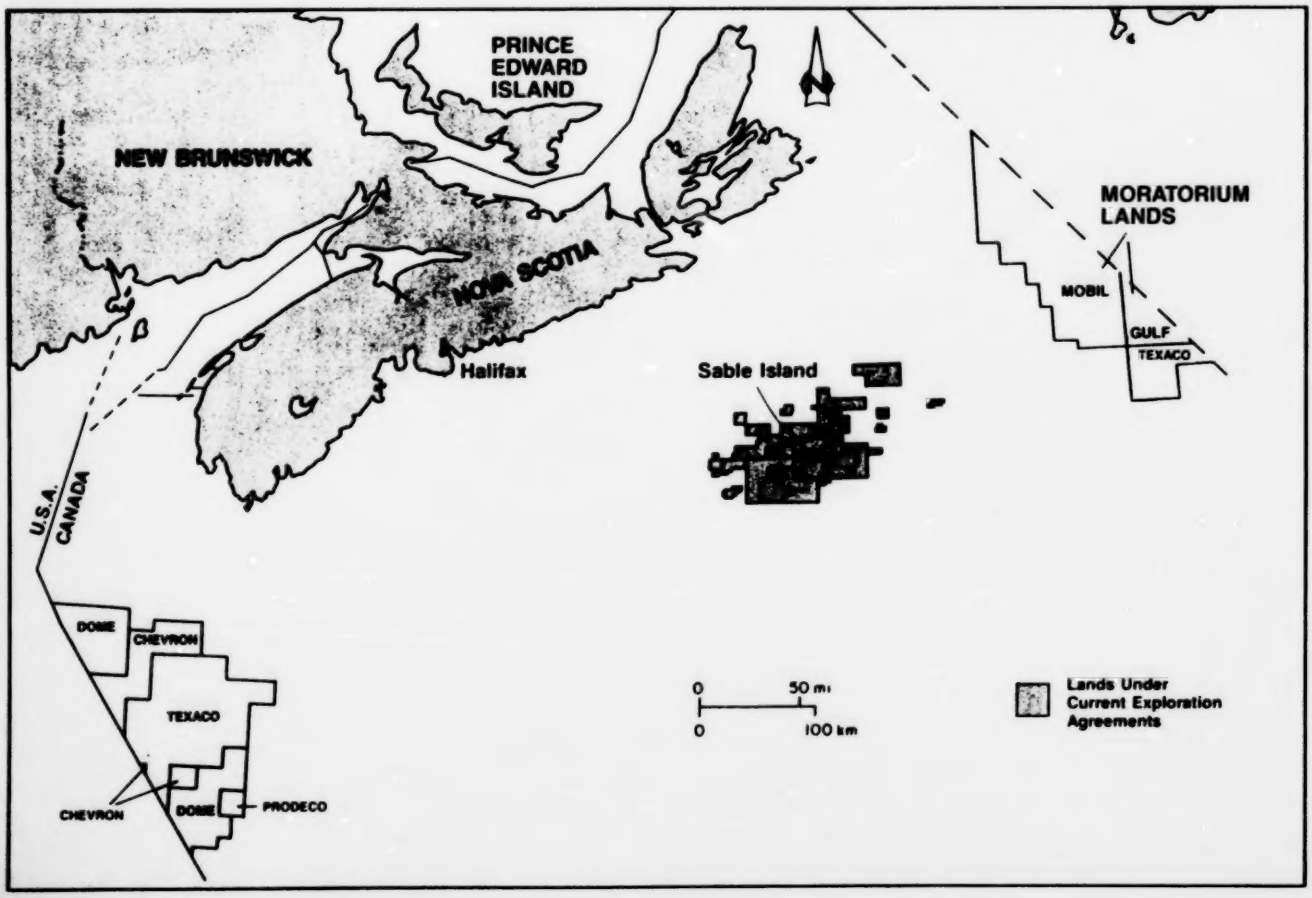
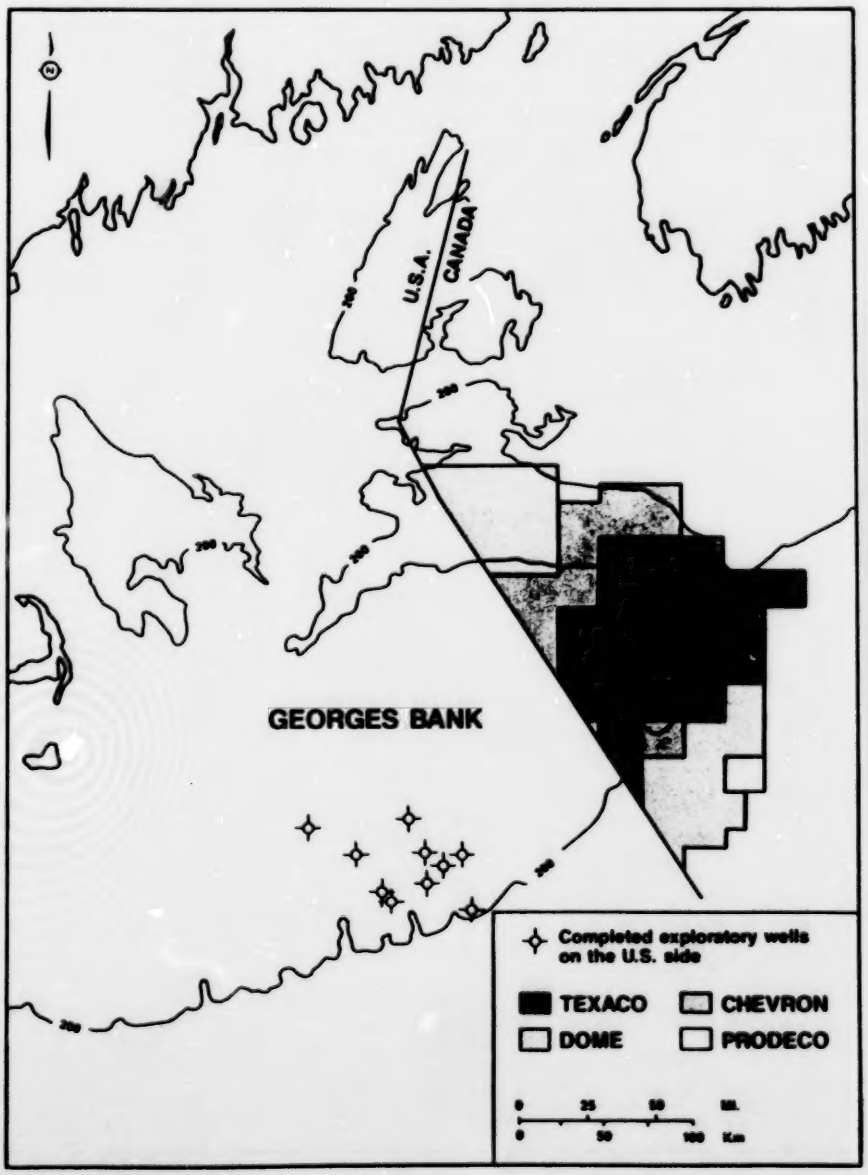


Table 1. *Rental Rates during the Second Period of Exploration Agreements on Nova Scotia Offshore Shelf and Slope.*

Shelf		Slope	
4th year	$2.02 per acre ($5/ha)	5th year	$1.01 per acre ($2.50/ha)
5th year	$4.05 per acre ($10/ha)	6th year	$2.02 per acre ($5/ha)
6th year	$6.07 per acre ($15/ha)	7th year	$3.04 per acre ($7.50/ha)
		8th year	$4.05 per acre ($10/ha)

Figure 6

Companies Holding Exploration Permits over the Canadian Portion of Georges Bank

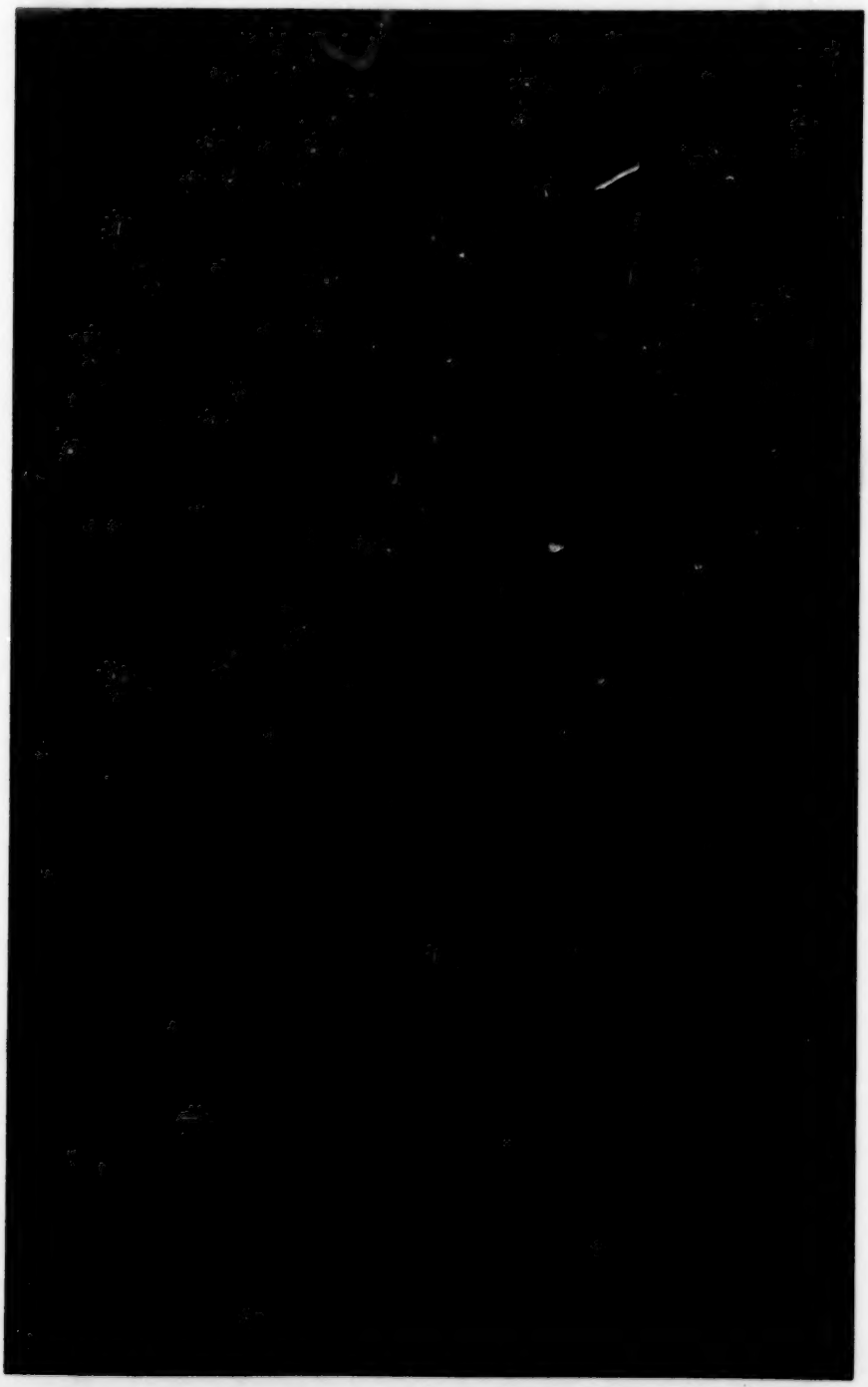


GEORGES BANK

Georges Bank has considerable potential hydrocarbon reserves, estimated to be in excess of two billion barrels (3.2 million m^3) of oil and up to 10 trillion cubic feet (283 billion m^3) of natural gas. Exploration permits covering parts of Georges Bank were issued to several companies by the federal government in the 1960's, but a subsequent moratorium prevented exploration, pending settlement of the Canada-U.S. boundary issue. Following resolution of the boundary dispute in 1984, no exploration agreements have been issued for Georges Bank pending a decision of the Canada-Nova Scotia Offshore Oil and Gas Board to authorize work in the area. Under the 1984 Canada Oil and Gas Act, which put in place a new regime under which federal exploration agreements were issued, holders of former offshore permits can negotiate exploration agreements to replace their former permits. Companies holding these former permits have once again expressed interest in exploration in the area (Figure 6).

In May 1986, the Canada-Nova Scotia Offshore Oil and Gas Board completed a detailed screening document which analyzed the possible impacts of petroleum exploration on Georges Bank. The screening document recommended, among other things, that operators establish a consultative process with the fishing industry early in the exploratory drilling planning process. Texaco Canada Resources Limited initiated this process in December 1986, with a series of public meetings in southwestern Nova Scotia. As a result of these meetings, further studies have been undertaken by Texaco and the fishing industry.

3 EXPLORATION ACTIVITY



Dawn on the Scotian Shelf.
Photo: Gordon A. Murray.

Over the past two years, the decline in world oil prices has caused a decrease in exploration in the Nova Scotia offshore and worldwide. On the Scotian Shelf, drilling commenced on six wells in 1986, compared with a peak of 14 wells in 1984 and an average of eight wells per year since 1981 (Figure 7). In addition, three wells were spudded in the first five months of 1987 (Figure 8).

To provide further detail on the Cohasset oil discovery, 381 miles (613 km) of 3-D seismic data were acquired in the past year, with an additional 48 miles (78 km) of well-site seabed survey completed.

During 1986 and the first half of 1987, average well costs on the Scotian Shelf continued to decline from the 1981-84 period averages (Figure 9). The decrease was largely the result of a reduction of rig and support vessel rates (which can account for over 40 per cent of the daily cost of a one-well drilling program) due to stiff competition worldwide. Shallower drilling targets and improved efficiency in drilling operations also contributed to lower well costs.

The following operators were active offshore Nova Scotia in the past year:

Shell

Shell Canada completed its recent East Coast drilling program with the delineation well Glenelg N-49 and the exploration well Panuke B-90.

Mobil

Mobil and partners completed the Thebaud C-74 delineation well and plan to continue their drilling program offshore Nova Scotia with a number of wells commencing in 1988.

Husky/Bow Valley

Husky/Bow Valley concluded its recent Scotian Shelf exploration program, completing the Chebucto K-20 well just south of the North Triumph discovery.

Petro-Canada

Petro-Canada and partners drilled the new field wildcat well Como P-21, just west of the Cohasset oilfield and northwest of the Panuke B-90 oil discovery. The delineation well, Panuke F-99, was spudded during July. At the time of writing, drill stem tests are being concluded and an extended production test, which recovered 24,000 barrels (3 821 m^3) of light, sweet crude for refinery processing, has been completed.

Canterra

Canterra drilled the Whycocomagh N-90 wildcat with the semi-submersible Sedco 710.

Figure 7

Drilling Activity Offshore Nova Scotia, 1967-1987

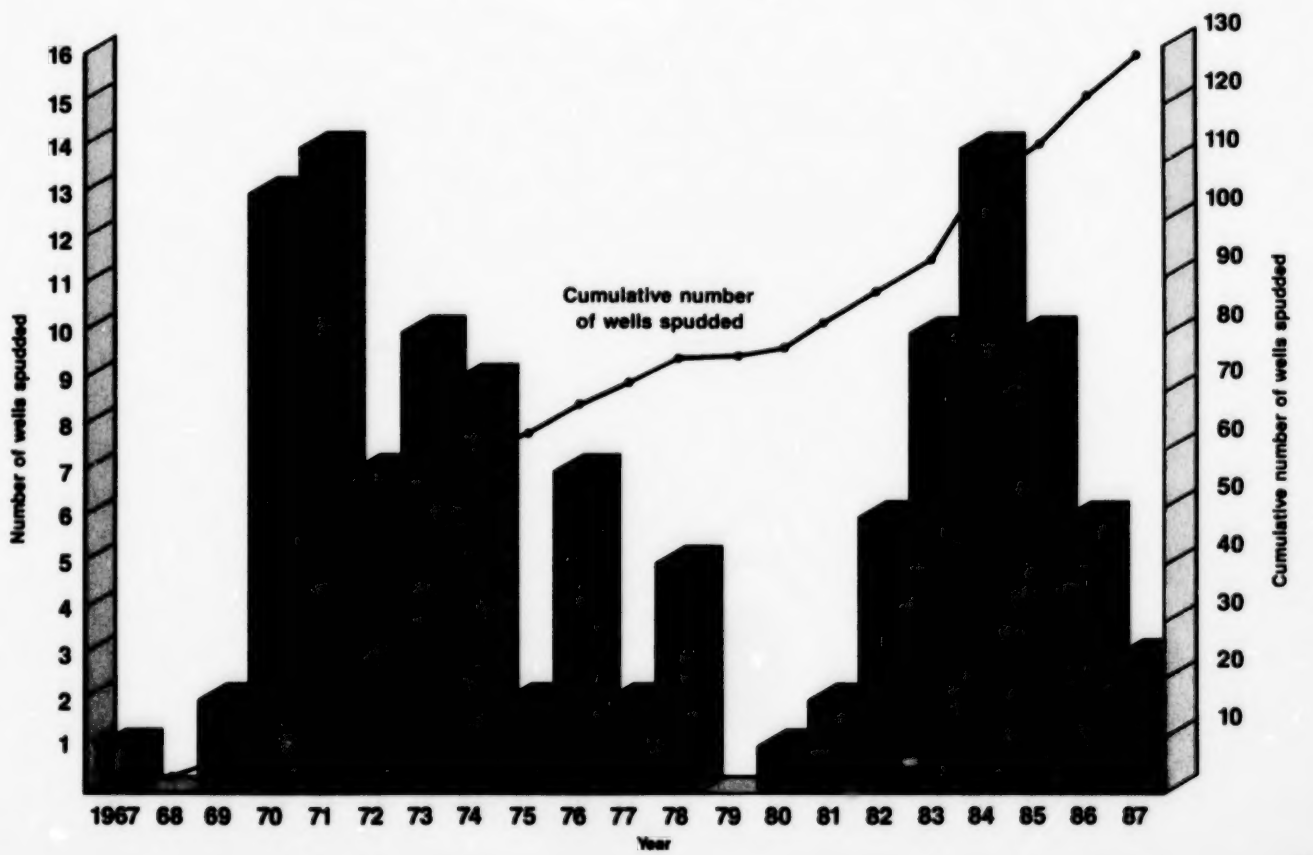


Figure 8

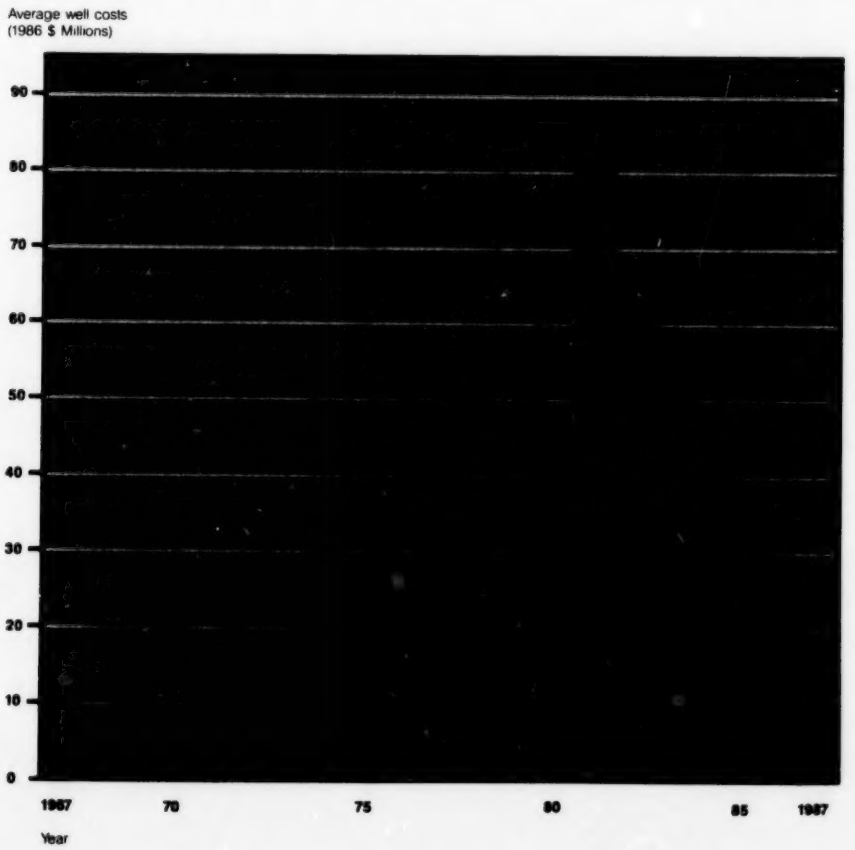
Offshore Statistical Summary, 1981-87

		1981	1982	1983	1984	1985	1986	1987[1]
Exploration Agreements Concluded (Based on Effective Dates)		0	26	6	3	10	2	-
Miles of Seismic Shot		11,662	18,909	22,960	13,414	16,662	429	N/A
Wells Spudded		2	6	10	14	10	6	3
Wells Completed		1	3	10	13	14	8	2
Total Footage Drilled		26,227	93,648	178,038	233,090	154,409	97,585	N/A
Rigs Active[2]		2	3	6	7	5	3	1
Dollars spent by Operators (Millions)	Seismic	17.4	37.1	48.5	23.2	29.2	0.9	N/A
	Drilling	65.0	220.0	564.4	594.7	452.0	176.8	N/A
TOTAL		**82.4**	**257.1**	**612.9**	**617.9**	**481.2**	**177.7**	**N/A**

[1]To mid-July [2]Average number of rigs working during the year

Figure 9

Average Well Costs Offshore, 1967-July 1987



4 EXPLORATION AND DELINEATION DRILLING RESULTS

Exploration activity continued to focus on proving additional commercial reserves around Sable Island through delineation drilling of existing discoveries and drilling new structures detected through seismic analysis. By June 1987, the 123rd well in Nova Scotia's offshore history had been completed. Of these wells, 71 per cent have been wildcats (the first well drilled on a new geological feature) and 29 per cent were delineation wells (to evaluate discoveries already made).

During the past year a gas show occurred at West Chebucto, and the Glenelg structure was successfully delineated by a fourth well. An encouraging oil discovery was made on the Panuke structure in the latter part of the year and was successfully delineated by a second well in July-August 1987.

Seventeen significant natural gas finds and four significant oil discoveries have been recorded since drilling first began (Figure 10). Thirteen of the discoveries have come since the 1979 Venture discovery — six on Mobil's Sable Island block, five on Shell's Shelf lands, one on Husky/Bow Valley's Chebucto block, and one on Petro-Canada's Banquereau exploration agreement. The high success rate recorded in the past seven years can be attributed to a number of factors — the focus of drilling in the Sable Island area as a result of the Venture discovery in 1979; improved geophysical technology; and a greater understanding of the geology of the area as the number of wells drilled in the Sable Island area multiplied.

In March 1987, the Canada-Nova Scotia Offshore Oil and Gas Board declared 15 discoveries "significant" under criteria established in the current provincial and federal legislation (Figure 11). These discoveries were the first to be accorded this status and will be carried forward under new provincial and federal legislation pursuant to the new Canada-Nova Scotia Offshore Petroleum Resource Accord.

Under current legislation, a discovery may be declared significant if a discovery well on a geological structure flows hydrocarbons when tested and if geological and engineering information suggest that the structure has potential for hydrocarbon production. Exploration agreements on lands where a significant discovery has been made are exempt from expiry. Once a discovery has been declared significant, the Board can, however, order a company to drill one or more wells. Each declaration includes the name of the discovery well and a description of the lands surrounding the well making up the discovery area. Discoveries declared significant by the Board include Mobil's Venture discovery and other gas discoveries by Mobil, Shell, and Petro-Canada.

The most recent resource estimates (1987) by the Canada Oil and Gas Lands Administration (COGLA) for offshore Nova Scotia show discovered resources of 5.3 trillion cubic feet (150.6 billion m^3) of gas and 139 million barrels (22.1 million m^3) of oil and condensate (Figure 12). This represents a 50 per cent increase in discovered gas resources since the Venture discovery in 1979. Oil resources (including condensate) increased more than 40 per cent over those resources discovered prior to the Venture discovery.

Following is a summary of the results of wells active during the past year:

Mobil et al Thebaud C-74
This third delineation well on the Thebaud structure reached a total depth of 16,896 feet (5 150 m). Seven zones tested significant gas/condensate flow rates. Five tests below 13,000 feet (4 000 m) produced gas from zones not previously established as productive on the structure. The well flowed at rates as high as 49 million cubic feet per day (1.4 million m^3/d).

Husky/Bow Valley et al Chebucto K-20
This well was drilled to a depth of 17,616 feet (5 369 m) to test for the presence of gas in a separate structure west of the Chebucto K-90 well. The well tested gas at rates of 5.3 million cubic feet per day (149 320 m^3/d) from one zone at 16,470-16,522 feet (5 020 - 5 036 m).

Shell et al Glenelg N-49
Shell and partners drilled this third delineation well on the Glenelg structure, 1.6 miles (2.5 km)

north of the discovery well J-48. The 13,255-foot (4 040 m) well tested dry gas in three zones between 11,124 and 11,819 feet (3 391 - 3 603 m) with flow rates of 16.6, 30.7 and 20.7 million cubic feet per day (470 000, 869 000, 587 000 m^3/day). These gas zones are similar to those in the discovery well and demonstrate the presence of natural gas to the north.

Shell PCI et al Panuke B-90

Shell continued their drilling success with an oil discovery on the Panuke structure, 6 miles (10 km) southwest, which is on trend with the Cohasset oilfield. Panuke B-90 reached 11,303 feet (3 445 m) and tested oil, the lightest to date with a 56° API gravity, at 6,096 barrels per day (969 m^3/d) with no water.

Canterra et al Whycocomagh N-90

Canterra drilled this well to 11,597 feet (3 535 m) and abandoned it without testing.

Petro-Canada et al Como P-21

This well was drilled to 11,614 feet (3 540 m); however, it did not encounter significant oil or gas pay and was abandoned without testing.

Petro-Canada et al Panuke F-99

The drilling of this well during the summer of 1987 demonstrated the westerly extent of the Panuke reservoir through a testing program in which three tests have been conducted to date, the longest of which produced 4,000 barrels per day (635 m^3/day) during a unique 6-day testing procedure utilizing a tanker to collect the high quality oil. The oil was shipped to the Petro-Canada refinery in Montreal for refining and further testing. This is the first shipment of crude oil from Canada's East Coast offshore. The testing program for this well was ongoing at the time of writing.

Figure 10

Significant Oil and Gas Discoveries and Test Summary

					GAS		OIL	
OIL	**No. of Wells Drilled into Each Structure**	**Key Wells**	**Year Drilled**	**Total Depth (ft.)**	**Maximum Test Rate (Single Test) (MMCF/d)**	**Combined Test Rate (MMCF/d)**	**Maximum Test Rate (bbls/d)**	**Combined Test Rate (bbls/d)**
1. Panuke	1	B-90	1986	11,302	0.4	0.4	6,096	6,096
2. Cohasset	3	A-52	1986	9,340	.270	1.1	7,740	29,200
		D-42	1973	14,521	.071	.096	1,050	1,565
3. Primrose	3	N-50	1972	5,622	17.4	50.5	330	650
4. West Sable	8	O-47	1972	13,775	5.8	6.1	Traces of Oil	
		E-48	1971	11,820	10.6	64.0	2,880	4,080
GAS and Condensate							**CONDENSATE Combined Test Rate (bbls/d)**	**(bbls/MMCF)**
5. North Triumph	2	B-52	1986	12,992	27.5	27.5	150	5.4
		G-43	1985	14,777	37.0	72.2	360	5.0
6. West Olympia	1	O-51	1985	15,800	21.3[1]	21.3[1]	576[1]	27.0[1]
7. West Venture	1	C-62	1984	18,117	33.5	33.5	160	4.8
8. West Venture	1	N-91	1984	18,200	*	*	*	*
9. Chebucto	1	K-90	1984	17,175	22.1	44.5	324	7.3
10. Alma	2	K-85	1985	11,817	30.2	90.2	827	9.2
		F-67	1984	16,581	29.8	61.2	709	11.6
11. Uniacke	1	G-72	1984	18,816	20.6	26.6	150	5.6
12. Glenelg	4	N-49	1986	13,255	30.7	68.0	363	5.3
		F-58A	1984	13,753	23.4[2]	34.4[2]	387[2]	11.2[2]
		J-48	1983	16,890	30.0	92.4	640	6.9
13. Arcadia	1	J-16	1983	19,701	14.1	25.0	119	4.8
14. South Venture	1	O-59	1982	20,261	18.2	93.4	3,403	36.4
15. Olympia	1	A-12	1982	19,896	17.5	56.0	845	15.1
16. Banquereau	1	C-21	1982	16,375	19.9	20.7	100	4.8
17. Venture	5	H-22	1984	19,501	38.0	68.3	781	11.5
		B-52	1983	19,554	49.7	63.1	207	3.3
		B-43	1982	19,268	15.0	95.0	2,800	22.1
		B-13	1981	17,600	18.6	81.2	1,158	14.3
		D-23	1979	16,200	22.6	44.4	548	12.3
18. Intrepid	1	L-80	1974	13,651	7.6	18.1	191	10.5
19. Citnalta	1	I-59	1974	15,010	11.0	19.6	1,331	68.0
20. Thebaud	4	C-74	1986	16,896	47.6	238.4	2,529	10.6
		J-93	1985	16,949	28.8	35.4	849	24.0
		J-94	1978	12,997	13.7	13.7	404	29.5
		P-84	1972	13,500	10.6	30.0	103	3.4
21. Onondaga	4	E-84	1969	13,085	•	•	•	•

* Well control problems prevented tests from being run in this well.
• Not flow tested but mechanical logs indicated a good reservoir.
[1] These initial rates were tested but declined during testing.
[2] These initial rates were tested but declined during testing.

NOTE: MMCF/d — million cubic ft. per day

Figure 11

Discoveries Declared Significant by the Canada-Nova Scotia Offshore Oil and Gas Board

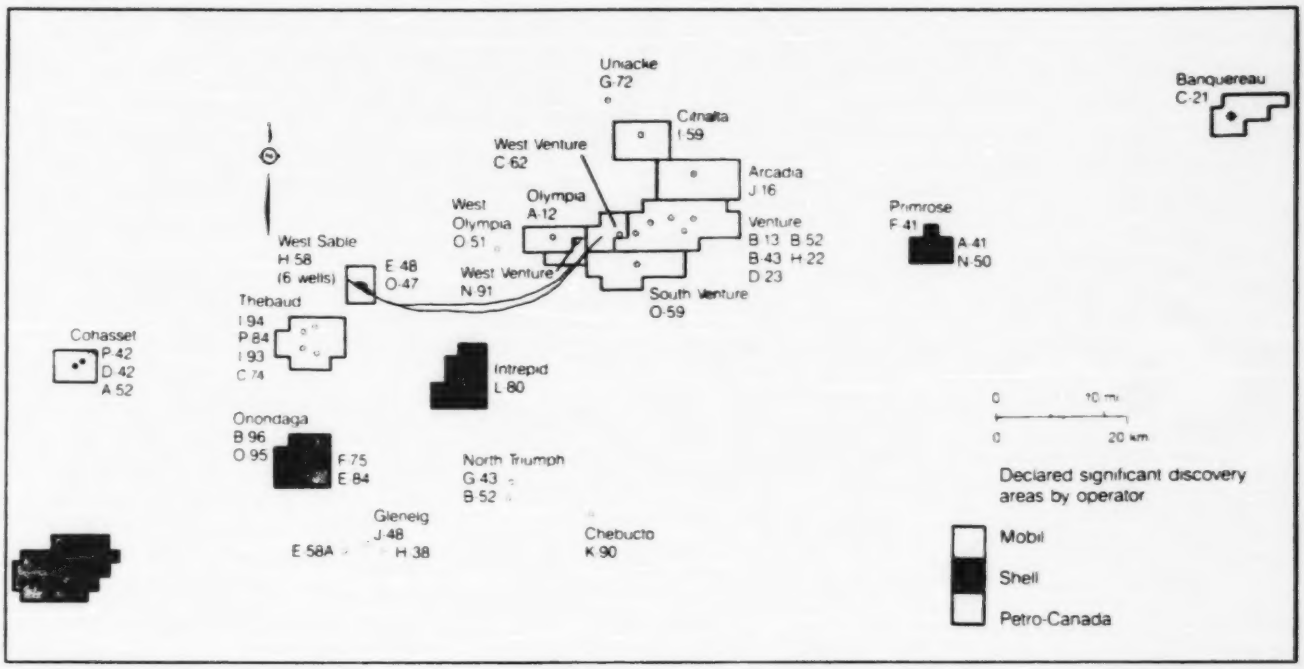
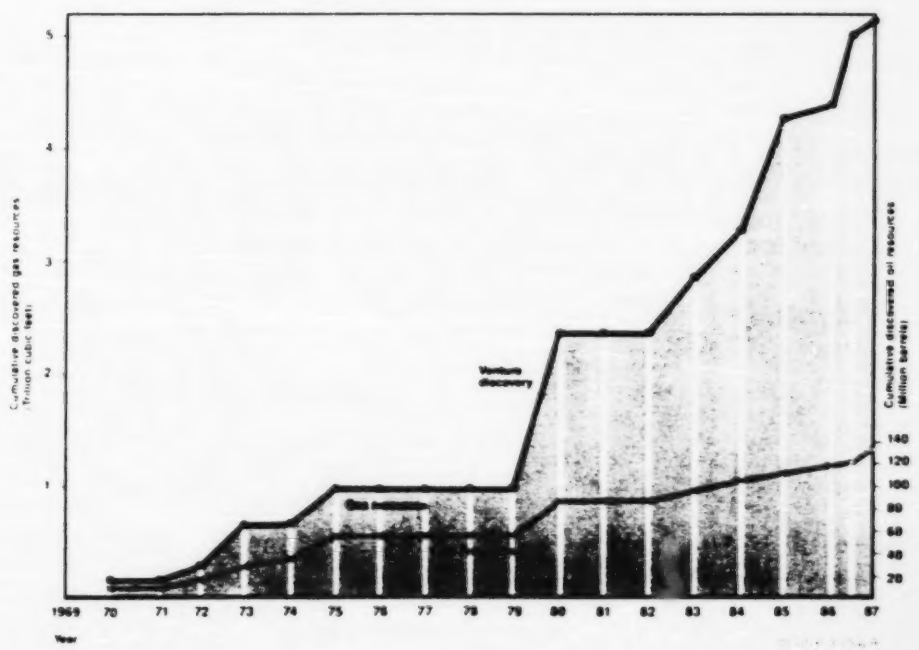


Figure 12

Discovered Gas and Oil Resources Offshore Nova Scotia, 1969-July 1987



5 DEVELOPMENT PROSPECTS

The dramatic reduction of world oil prices has delayed the schedule for petroleum development in offshore Nova Scotia, but progress is being made by operators in establishing the basis for commercial production of both gas and oil. The following is a summary of significant events in gas and oil development in the past year.

VENTURE GAS PROJECT

Mobil and partners completed the third delineation well (Thebaud C-74) on the Thebaud Structure. The well gave encouraging results, particularly in deeper, previously untested horizons, and resulted in additional estimated reserves for the Thebaud field.

Mobil continued engineering analysis of various development scenarios in an effort to optimize the project, and has initiated discussions with Shell and partners to examine the feasibility of jointly developing significant natural gas discoveries in the vicinity of Sable Island. This joint development could further optimize the development of gas in offshore Nova Scotia and lead to earlier production. The Governments of Nova Scotia and Canada are also investigating ways in which they can assist the project partners to get the project underway at an early date.

SMALL OILFIELD DEVELOPMENT

Good progress has been made by Petro-Canada and partners to evaluate the viability of small-scale oilfield development. The group has undertaken extensive reservoir and facility analysis on Cohasset, a small field discovered in 1973 and successfully delineated in 1986. Analysis to date indicates that a viable commercial development is possible, utilizing a converted jack-up drilling rig as a production platform and transporting the oil to shore using shuttle tankers.

Petro-Canada and partners' oil discovery at Panuke B-90, 6 miles (10 km) southwest of Cohasset, opens the possibility of another small oilfield which might be developed in conjunction with Cohasset. This field was successfully delineated by Panuke F-99, which commenced in July 1987. Detailed information collected during the 6-day production test, which was completed just prior to the writing of this report, will be analyzed and will provide valuable information on the reservoir and oil characteristics of the Panuke field.

No firm timetable has been established for development of these oilfields, but, given stable oil prices at acceptable levels, it is estimated the fields could be brought into production in under two years.

6 OFFSHORE SAFETY AND TRAINING

Fast rescue craft exercise offshore Nova Scotia, conducted jointly by the Canadian Coast Guard and Survival Systems Ltd. Photo: Paul Potter.

Drilling in a hazardous offshore environment such as the Scotian Shelf requires a degree of emphasis on survival and safety that would not apply to onshore operations. Consequently, considerable effort has been directed by the offshore operators, the Nova Scotia Department of Mines and Energy, and the federal government, towards evaluating and improving aspects of offshore safety.

Improvements in onshore safety and training require an ongoing effort and commitment by operators, drilling contractors, and service companies. A minimum requirement is that those working offshore receive sufficient training to be aware of the increased risks of working offshore and of the need to be safety conscious at all times. The Department of Mines and Energy, in co-operation with the Canada Oil and Gas Lands Administration (COGLA), regularly reviews and evaluates safety practises and capabilities of the Scotian Shelf operators. In recent years the Department has participated in joint industy/government groups and task forces set up specifically to address conflicts and deficiencies in safety and training regulations.

Several local companies also focus on improving the level of offshore safety. Survival Systems Ltd., a Dartmouth, Nova Scotia, based offshore training centre, provides a variety of safety and survival courses for organizations which operate in the offshore including offshore oil and gas operators, the Canadian Navy, and Canadian Coast Guard personnel. Courses incorporate the latest in approved survival techniques and up-to-date technology and equipment. The Coordination and Organization Research and Development Group (CORD), also based in Dartmouth, conducts various safety-related projects, including evaluation of immersion suits worn by offshore rig workers travelling by helicopter to and from rigs. The CORD Group is an active member of the Canadian General Standards Board Committee on immersion suits and the Working Group on Marine Anti-Exposure Work Suit System Standards.

7 SABLE ISLAND

Sable Island. Photo: Gordon A. Murray.

The reader will have noticed Sable Island shown on many of the maps of the Nova Scotia offshore area. The Island has a special strategic significance in the history of petroleum exploration offshore and it was felt that more information on the Island should be provided in this year's report.

Besides being situated near the major gas discovery at Venture, the Island was also the site of early drilling. An unconsolidated sandbar nearly 24 miles (38 km) long and .9 miles (1.5 km) at its widest, Sable Island is situated approximately 175 miles (280 km) southeast of Halifax. Five thousand years ago, when the sea rose to its present level after the last glacial age, waters from the cold Labrador current and the warm Gulf Stream gathered sandy glacial deposits near the edge of the Continental Shelf. Through time, this buildup of sand emerged as Sable Island (from the old French word "sablon" — sand).

Sable Island was probably first sighted in 1497 by John Cabot, and was shown on Portuguese maps early in the 16th Century. Various settlers such as the Acadians and the Boston Huguenots attempted to establish communities on the Island during the 1600's and the 1700's, but were unsuccessful because of harassment and pillaging by marauding fishermen. Through the 1800's, the population hovered close to 30, including boatmen who doubled as carpenters, farmers, and fishermen. Long before, Sable Island had become known as the graveyard of the Atlantic since its position close to the old sailing route between Britain and New England made it a prime site for shipwrecks. More than 500 ships and 5,000 people have been lost in the vicinity of Sable Island. Many Sable Islanders served as lookouts to watch for and assist ships in distress.

Since the last major wreck, the grounding of the freighter **Manhasset** in 1947, improved navigation systems were introduced to the Island and have reduced the risks of disaster considerably.

Sable Island is well known for its wildlife. Its best known inhabitants are its ponies, whose ancestors came to the Island as survivors of shipwrecks in the 18th Century. Also unique is the Ipswich sparrow, which breeds here and nowhere else.

The Sable Island area has been the focus of oil and gas exploration since 1967 when the first offshore well was drilled in the centre of the Island. Eight more wells were drilled on the western tip of Sable Island during the 1970's. Located so close to the majority of offshore Nova Scotia drilling locations, Sable Island serves as an ideal evacuation base for drilling rig personnel during emergencies and bad weather. An emergency helipad has been constructed on the Island and emergency accommodation buildings are equipped with food, sleeping bags, and fuel.

Today only a handful of people, primarily weather observers, permanently reside on the Island. Other temporary visitors are scientists studying the Island's unique ecology, and technicians who maintain automatic lighthouses, radio-navigation beacons, and survey equipment for positioning drilling rigs and tracking seismic vessels.

1 GEOLOGY

Most onshore petroleum exploration has concentrated on rocks of Carboniferous age. Exposures occupy about a third of the Province in several sedimentary basins, including the Minas Sub-basin, Cumberland Sub-basin, Stellarton Gap-Pictou Sub-basin, Antigonish Sub-basin, and Inverness-Mabou Sub-basin (Figure 13).

The Carboniferous rocks were formed from sediments first deposited in narrow elongate basins bordered to the northwest by uplands in New Brunswick and to the south by an uplifted region of pre-Carboniferous rocks in Nova Scotia. The first sediments were deposited in the Fundy Depositional Basin and came from both bordering areas. These sediments form the Horton Group, and consist of red to grey sandstone, conglomerate, siltstone, and shale.

A commercial oil and gas field in Horton Group rocks in the Albert Formation of New Brunswick is currently producing from a section of the same regional Carboniferous basin which extends through much of Nova Scotia. The Stoney Creek field in the Moncton Sub-basin produced 28.5 billion cubic feet (807 million m^3) of gas and 800,000 barrels (127 000 m^3) of oil between its discovery in 1909 and the end of 1986. In 1986, gas production at Stoney Creek was 64 million cubic feet (1.8 million m^3) and oil production 4,019 barrels (639 m^3).

Overlying Horton Group strata are younger Carboniferous rocks of the Windsor Group, consisting of thick members of massive to poorly bedded red and greenish-grey mottled siltstone, shale, and sandstone, interbedded with gypsum, anhydrite, shale, and thin tabular sequences of limestone and dolomite. Thick salt deposits occur at a number of localities and have had a noticeable effect on deformation in some areas. Salt flowage in some of the basins accounts for salt diapirs, domes, and ridges.

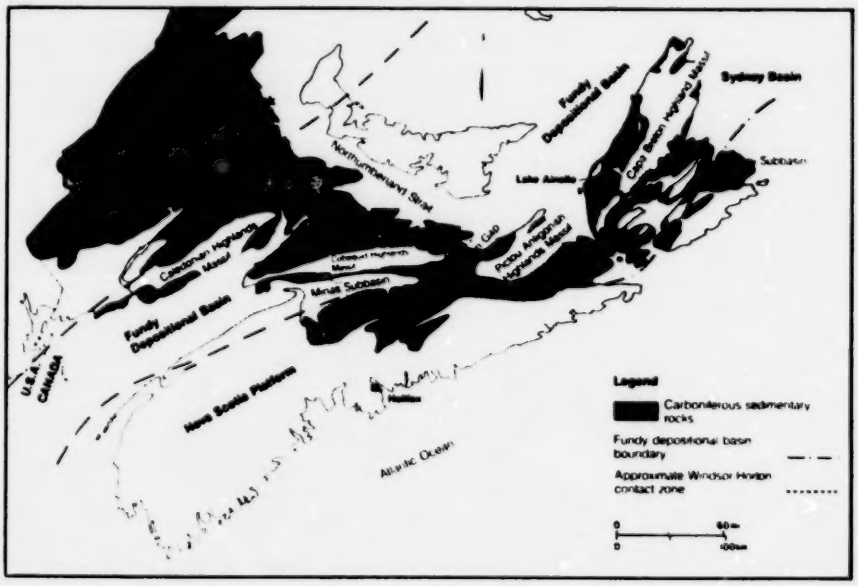
The Canso Group lies above the Windsor Group and contains mainly thinly laminated red and grey shales, sandstone, and minor limestone. Deposited later were rocks of the Riversdale Group, thick deposits of coarse clastics (red and grey sandstone and shale), non-marine red and grey sandstone, siltstone, shale, and coal.

The Cumberland Group of the Late Carboniferous contains appreciable amounts of coal. Rocks of the group lie over Carboniferous and older strata and include non-marine red and grey conglomerate, sandstone, shale, and mineable coal seams.

During the deposition of the upper part of the Cumberland Group, non-marine fluvial and fluvio-lacustrine red and grey sandstones, shales, and minor conglomerates of the Pictou Group, were deposited in other areas. These Pictou sediments unconformably overlie older

Figure 13

Carboniferous Age Sediments Onshore Nova Scotia



Paleozoic rocks and onlap the older metamorphic basement rocks. In the Late Carboniferous, swamps flourished and therefore thick coal deposits accumulated in a number of sub-basins.

The potential for petroleum accumulations within Carboniferous rocks depends on the presence of organic rich source rocks and the migration and accumulation, within reservoir quality formations, of hydrocarbons generated from these source rocks. Organic material, of both marine and non-marine origin, is found within the Carboniferous strata of Nova Scotia. In addition, a variety of potential geological hydrocarbon traps are found in the Province. These include traps related to salt movement, faulting, carbonate reefs, folding, porosity-permeability pinchouts, unconformities, and stratigraphic changes.

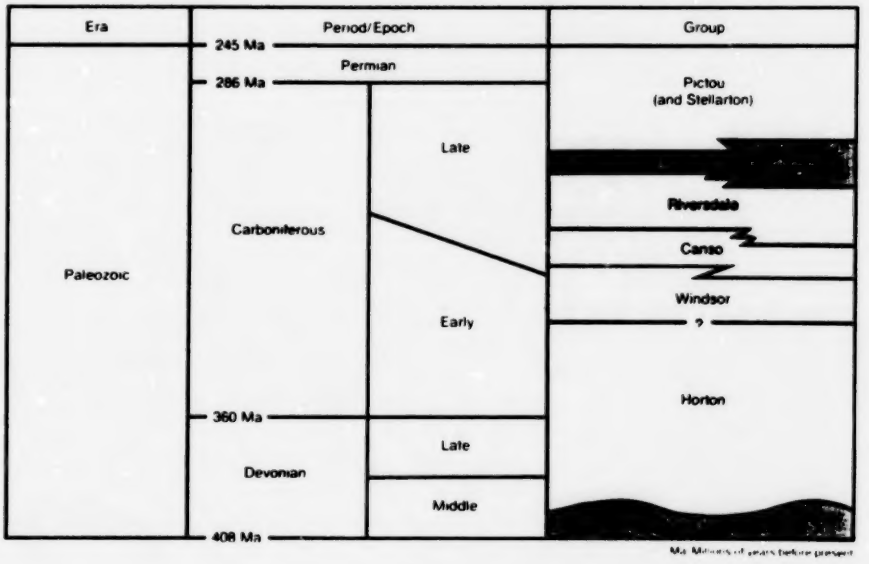
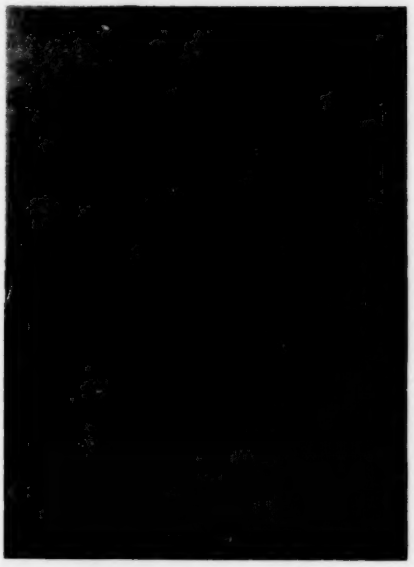


Figure 14
Geological Time Scale

2 HISTORY



Drilling for petroleum in Hantsport, Nova Scotia 1902-1903

Widely scattered occurrences of oil and gas in Nova Scotia have been reported over the years. Surface occurrences were reported as early as the middle of the last century when an oil seep was discovered on the shores of Lake Ainslie, Inverness County. Since then, 25 significant surface shows of petroleum have been reported and various hydrocarbon occurrences have been noted in wells and drillholes throughout the Province. These include significant petroleum shows in about a third of the 97 petroleum wells drilled since 1869 and in at least 68 wells drilled for purposes other than petroleum exploration. The most recent show was in a water well drilled on the east side of Lake Ainslie in October 1985. All shows to date have occurred in Windsor Group rocks (marine origin), and in rocks in the non-marine Horton, Stellarton, and Pictou Groups (Figure 14).

After the Lake Ainslie Pioneer Oil & Salt Co. drilled the first recorded Nova Scotia well in the Mabou area near Lake Ainslie, Cape Breton Island, in 1869, onshore drilling activity reflected the excitement and interest in petroleum exploration prevalent in the rest of North America at the time. Twelve of the 19 wells drilled between 1869 and 1905 were concentrated in the Mabou-Lake Ainslie area, where surface seepages of oil had been noted during the mid-1800's (Figure 15). The remaining seven wells were drilled near Cheverie, Hants County, and Stellarton, Pictou County.

Between 1899 and 1906, an extensive exploration program in southeastern New Brunswick resulted in the drilling of 72 wells and led to a commercial oil and gas discovery in 1909 at Stoney Creek, situated about 9 miles (14.5 km) south of Moncton. The Stoney Creek discovery

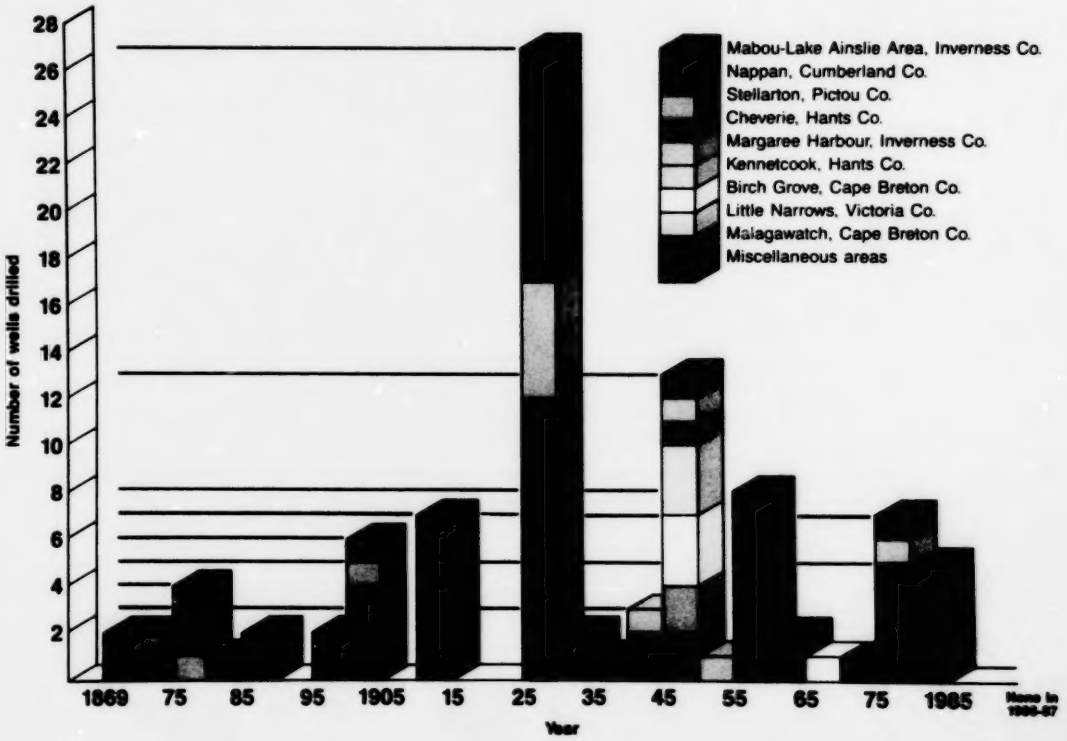


Figure 15

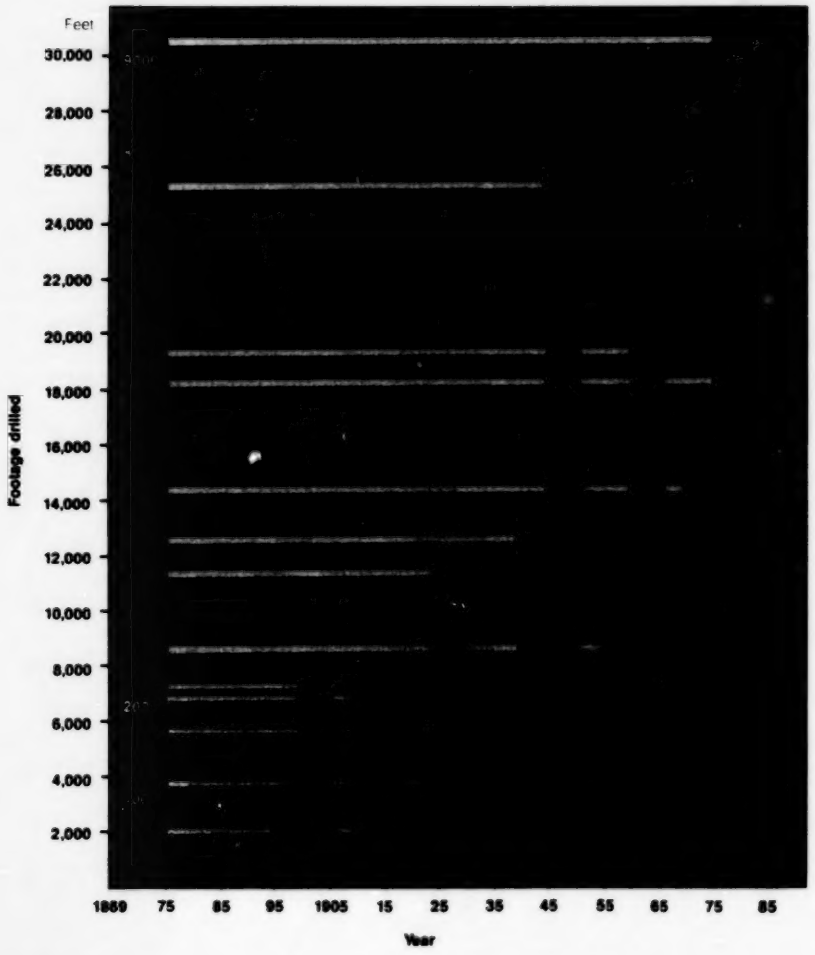
Number of Onshore Wells Drilled by Area and Year, 1869-1987

stimulated the drilling of seven wells centered in the Mabou-Lake Ainslie area of Nova Scotia between 1910 and 1915. This area and other parts of northern Nova Scotia lie within the same section of the regional Carboniferous basin as the Stoney Creek discovery.

From 1926 to 1930, Eastern Gulf Oil Company embarked on a 17-well diamond drilling program in Inverness County following encouraging field reconnaissance in the area. During the same period, Imperial Oil Limited finished 10 wells in the Nappan area of Cumberland County. With the Depression of the 1930's came a significant decrease in exploration activity and only one well was drilled between 1931 and 1944.

Figure 16

Footage Drilled by Year, Onshore Nova Scotia, 1869-1987



On March 28, 1942, an "Act to Regulate the Search for Petroleum and Natural Gas" was enacted in Nova Scotia. Previously, petroleum resources were regulated, along with all other mineral resources in Nova Scotia, under the Mines Act.

Interest in petroleum revived in North America during World War II, a result of the loss of East Indian oilfields to the Japanese. Drilling activity increased between 1944 and 1949 when 13 wells were drilled in Nova Scotia by six operators.

In 1956, the Petroleum and Natural Gas Act was passed to guide exploration and production activities for onshore petroleum resources.

Drilling activity picked up in the late 1950's and continued at an increased level into the early 1960's. A major contributor to activity was Imperial Oil Limited, whose exploration program in the Mabou-Lake Ainslie area of Cape Breton accounted for 8 of the 10 wells drilled during this time.

Chevron Standard's oil show at the Malagawatch #1 well on Cape Breton Island in late 1979 was the highlight of four wells drilled between 1975 and 1980 by Chevron, and three other wells drilled by separate companies during the same period. In 1981 Chevron drilled the Scotsburn #2 well in the Scotsburn area.

The last four wells drilled onshore, all in southwestern Cape Breton, were operated by Corkan Engineering of Canada Ltd. during the winter of 1983-84.

In July 1984, the new Petroleum Resources Act was proclaimed, replacing the Petroleum and Natural Gas Act (1956). Regulations pursuant to this new Act were brought into effect on October 30, 1985.

A total of 97 wells have been drilled onshore by at least 21 operators. The peak years for drilling activity were between 1925 and 1930 when a record 27 wells were drilled in the Province. The total footage drilled was clearly greater after the 1940's (Figure 16) and strongly reflects the advancement in drilling technology and the deeper exploration plays of recent years.

3 RECENT ONSHORE ACTIVITY

Four onshore exploration agreements, renegotiated under the Petroleum Resources Act in 1986, were carried over into 1987. In addition, a new exploration agreement was issued to Consultants A.G.R.E.N. Canada Inc., effective July 2, 1986. However, in July 1987, the Sigma Resources Ltd. exploration agreement terminated. Current onshore exploration agreements are shown in Figures 17 and 18.

The past year witnessed resumption of onshore exploration. In autumn 1986, Canjay Exploration Limited of Calgary conducted a geophysical program in the Kennetcook area over the exploration agreement held by Consultants A.G.R.E.N. Canada Inc., and are currently evaluating the results. Chevron also had personnel in the Province conducting field geological work.

The Department of Mines and Energy received several recent requests for information from parties interested in acquiring exploration rights onshore. If these companies, or others, decide that they wish to obtain exploration agreements, a Call for Proposals may be held. Such a Call would be the first to be issued under the Petroleum Resources Act.

The Petroleum Resources Section of the Nova Scotia Department of Mines and Energy has produced two new publications dealing with onshore petroleum drilling activity titled "Petroleum Wells and Drillholes with Petroleum Significance" and "Surface Petroleum Shows".

The "Petroleum Wells and Drillholes" publication is a compilation of available information relating to wells with petroleum significance which were drilled onshore. The report is divided into two sections — the first is a list of wells drilled onshore for petroleum exploration. The second section contains a list of boreholes, which were drilled for purposes other than petroleum exploration, that had petroleum shows of some significance.

The second publication, "Surface Petroleum Shows", provides a compilation of all available reports concerning significant surface petroleum shows onshore Nova Scotia.

The Department of Mines and Energy, through funding by the Canada-Nova Scotia Mineral Development Agreement, is undertaking a study on the petroleum source rock potential. This study, which is scheduled for completion in the spring of 1989, is intended to identify regions of the Province which are most prospective for petroleum exploration.

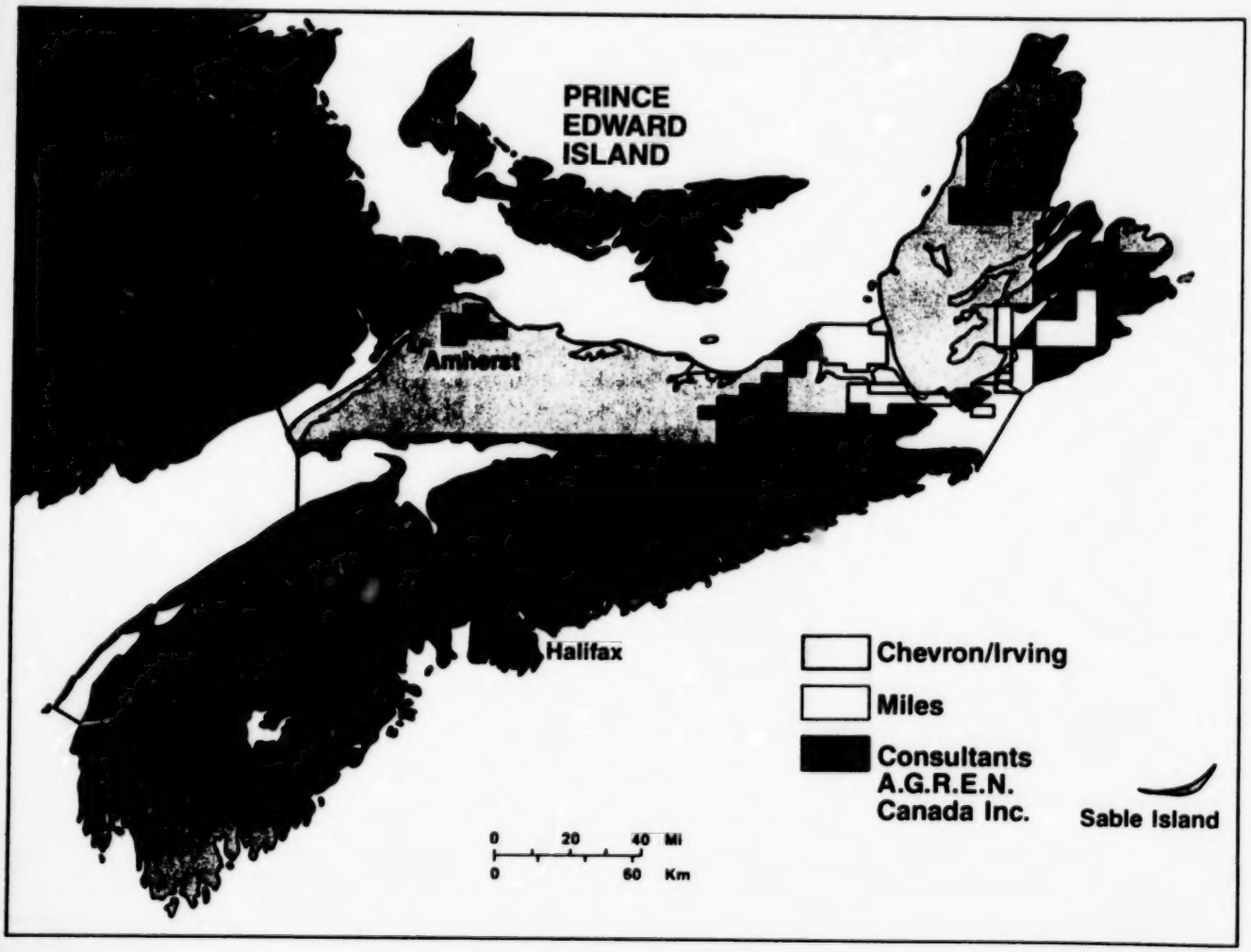
Figure 17

Summary of Onshore Oil and Gas Rights Holders, July 1987

Licensee	Negotiated Area (acres)	Negotiated Area (hectares)	No. of EAs Negotiated	Rentals Paid
Chevron Canada Resources Ltd.				
Cape Breton	1,469,743	594,805	2	$ 71,376.60
Cumberland	2,066,382	836,265		$100,351.80
Miles	315,468	127,719	1	15,641.04
Consultants A.G.R.E.N. Canada Inc.	46,780	18,648	1	2,237.76
Total	**3,898,373**	**1,577,437**	**4**	**$189,607.20**

Figure 18

Onshore Exploration Agreements Negotiated



APPENDICES

1 DIRECTORY OF OFFSHORE WELLS

The wells are arranged by "Spud Date".
Data current to July 1, 1987.

ABBREVIATIONS

RT	Rotary
KB	Kelly Bushing
GL	Ground Level
P&A	Plugged and Abandoned
P&S	Plugged and Suspended
TD	Total Depth
TS	Temporarily Suspended

WELL SYMBOLS

- Drilling
- Temporarily Suspended
- Plugged and Abandoned
- Significant Gas
- Gas Show
- Significant Oil
- Oil Show
- Significant Oil and Gas
- Oil and Gas Show

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS
Mobile Sable Island C-67	43°56'04.9" 59°55'01.4"	Bawden Rig 18	67-06-07 68-01-02	26.9 (8.2) KB 12.8 (3.9) GL	15,106 (4604.3) P&A
Shell Onondaga E-84	43°43'16.14" 60°13'17.41"	Sedneth 1	69-09-01 69-11-11	85 (25.9) 190 (57.9)	13,085 (3988.3) P&A
Shell Oneida O-25	43°14'57.36" 61°33'36.49"	Sedneth 1	69-11-16 70-02-10	85 (25.9) 270 (82.3)	13,516.7 (4119.9) P&A
Shell Naskapi N-30	43°29'46.78" 62°33'59.54"	Sedneth 1	70-02-16 70-03-19	85.3 (26) 312 (95.1)	7,235 (2205.2) P&A
Shell Mic Mac J-77	44°36'42.81" 59°26'10.86"	Sedneth 1	70-03-25 70-05-24	85.3 (26) 206 (62.8)	12,750 (3886.2) P&A
Shell Mohawk B-93	42°42'10.52" 64°43'53.50"	Sedco H	70-05-03 70-05-23	103 (31.4) 383.9 (117)	6,975 (2126) P&A
Shell Mississauga H-54	44°23'20.39" 59°22'47.56"	Sedneth 1	70-05-26 70-07-20	85 (25.9) 335 (102.1)	13,787 (4202.3) P&A
Shell Abenaki L-57	44°:16'34.49" 59°53'39.64"	Sedco H	70-05-28 70-07-06	103 (31.4) 359 (108.8)	7,147 (2178.4) P&A
Shell Onondaga O-95	43°44'48.09" 60°13'52.60"	Sedco H	70-07-09 70-08-16	103 (31.4) 176.8 (53.9)	10,874 (3314.4) P&A
Shell Huron P-96	44°35'47.10" 58°28'50.63"	Sedneth 1	70-07-22 70-08-27	85 (25.9) 190 (57.9)	9,903 (3018.4) P&A
Shell Iroquois J-17	44°26'31.37" 59°47'12.28"	Sedco H	70-08-18 70-09-06	103 (31.4) 194.9 (59.4)	6,845 (2086.4) P&A
Shell Mic Mac H-86	44°35'27.72" 59°27'03.12"	Sedneth 1	70-08-31 70-12-02	85 (25.9) 178.1 (54.3)	1:5,700 (4785.4) P&A
Shell Cree E-35	43°44'20.70" 60°35'55.89"	Sedco H	70-09-08 70-11-03	103 (31.4) 174.9 (53.3)	13,070 (3983.7) P&A
Shell Wyandot E-53	44°52'20.70" 59°23'54.05"	Sedco H	70-11-07 70-12-14	103 (31.4) 397 (121)	10,005 (3049.5) P&A
Shell Abenaki J-56	44°15'44.95" 59°53'03.22"	Sedneth 1	70-12-04 71-03-13	85 (25.9) 350 (106.7)	14,991 (4569.3) P&A
Shell Argo F-38	45°27'23.22" 58°50'24.34"	Sedco H	70-12-17 71-02-19	103 (31.4) 234.9 (71.6)	11,110 (3386.3) P&A
Shell Fox I-22	45°21'33.60" 59°33'16.00"	Sedco H	71-02-20 71-03-03	103 (31.4) 274.9 (83.8)	2,722 (829.7) P&A
Mobil-Tetco Esperanto K-78	44°47'31.26" 58°11'19.24"	Sedco H	71-03-09 71-04-24	103 (31.4) 225.1 (68.6)	11,615 (3540.3) P&A

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS
Shell Erie D-26	44°55'03.52" 59°34'29.82"	Sedneth 1	71-03-16 71-04-11	85 (25.9) 321.9 (98.1)	7,795 (2375.9) P&A
Shell Crow F-52	45°21'24.23" 59°08'22.73"	Sedneth 1	71-04-12 71-04-27	85 (25.9) 310 (94.5)	4,943 (1506.6) P&A
Mobil-Tetco Dauntless D-35	44°44'08.26 57°20'46.64"	Sedco H	71-04-26 71-07-16	103 (31.4) 227 (69.2)	15,555 (4741.2) P&A
Shell Sauk A-57	44°16'05.70" 58°37'44.41"	Sedneth 1	71-04-30 71-07-10	85 (25.9) 196.9 (60)	15,010 (4575) P&A
Mobil-Tetco Sable Island E-48	43°57'2035 60°07'24.44"	Bawden Rig 14	71-05-28 ;71-10-15	21 (6.4) 0 (0)	11,820 (3602.7) P&A
Shell Chippewa L-75	44°34'35.87" 58° 41'50.54"	Sedneth 1	71-07-12 71-08-12	81 (24.7) 222.1 (67.7)	6,975 (2125.9) P&A
Shell Onondaga F-75	43°44'17.84" 60°11'36.25"	Sedco H	71-07-28 71-09-07	103 (31.4) 185 (56.4)	12,765 (3890.8) P&A
Shell Triumph P-50	43°39'51.62" 50°51'02.36	Sedneth 1	71-08-04 71-10-10	85 (25.9) 295.9 (90.2)	15,077 (4595.4) P&A
Shell Eurydice P-36	45°25'47.30" 60°04'46.97"	Sedco H	71-09-15 71-10-24	98.1 (29.9) 540 (164.6)	9,728 (2965.1) P&A
Shell Chippewa G-67	44°36'20.50" 58°39'44.62"	Sedco H	71-10-28 71-12-18	98.1 (29.9) 230 (70.1)	12,040 (3669.8) P&A
Mobil-Tetco Sable Island O-47	43°56'56.70" 60°06'38.08"	Bawden Rig 14	71-12-13 72-07-01	23 (7) KB 5.9 (1.8) GL	13,775 (4198.6) P&S
Shell Mohican I-100	42°59'39.04" 62°28'51.32"	Sedco H	71-12-27 72-03-10	98.1 (29.9) 503 (153.3)	14,414 (4393.4) P&A
Shell Marmora C-34	43°43'13.79" 60°05'21.93"	Sedneth 1	72-01-15 72-03-31	85 (25.9) 189 (57.6)	13,248 (4037.9) P&A
Shell Primrose N-50	43°59'48.43" 59°06'51.63"	Sedco H	72-03-14 72-04-21	98.1 (29.9) 298 (90.8)	5,622 (1713.6) P&A
Shell-Mobil-Tetco Eagle D-21	43°50'06.73" 59°34'09.21"	Sedco H	72-04-22 72-07-02	98.1 (29.9) 168 (51.2)	15,290 (4660.4) P&A
Mobil-Tetco Sable Island I-H-58	43°57'27" 60°07'37"	Bawden Rig 9	72-06-03 72-08-27	35.1 (10.7) KB 5.9 (1.8) GL	9,971 (3039.2) P&A
Mobil-Tetco-Thebaud P-84	43°53'59.53" 60°12'19.34"	Sedco H	72-07-08 72-10-13	93.8 (28.6) 85 (25.9)	13,500 (4114.8) P&S
Mobil-Tetco Sable Island 2-H-58	43°57'27.14" 60°07'37.73"	Bawden Rig 9	72-10-06 72-12-31	34.8 (10.6) KB 5.9 (1.8) GL	9,050 (2758.4) P&S
Shell Primrose A-41	44°00'05.68" 59°06'18.26"	Sedco H	72-10-15 73-01-27	98.1 (29.9) 359.9 (109.7)	11,865 (3616.5) P&A
Mobil-Tetco Sable Island 3-H-58	43°57'27.20" 60°07'37.80"	Bawden Rig 9	73-01-01 73-03-21	34.8 (10.6) KB 5.9 (1.8) GL	12,270 (3739.9) P&S
Mobil-Tetco Bluenose G-47	44°06'20.79" 59°21'27.35"	Sedco J	73-01-25 73-04-25	98.1 (29.9) 267.1 (81.4)	15,050 (4587.2) P&A
Shell Primrose F-41	44°00'29.55" 59°07'06.52"	Sedco H	73-01-30 73-03-05	98.1 (29.9) 225.1 (68.6)	8,505 (2592.3) P&S
Shell Marmora P-35	43°44'59.36" 60°04'47.58"	Sedco H	73-03-06 73-04-21	98.1 (29.9) 174.9 (53.3)	13,428 (4092.9) P&A
Mobil-Tetco Sable Island 4-H-58	43°57'27.20" 60°07'37.80"	Bawden Rig 9	73-03-22 73-08-11	34.8 (10.6) KB 5.9 (1.8) GL	14,827 (4519.3) P&S
Shell Tuscarora D-61	44°40'10.35" 58°55'10.85"	Sedco H	73-04-23 73-06-02	98.1 (29.9) 258.9 (78.9)	12,925 (3939.5) P&A
Mobil-Tetco Cohasset D-42	43°51'06.52" 60°37'13.89"	Sedco J	73-04-27 73-07-16	103 (31.4) 135 (41.1)	14,525 (4427.2) P&S
Shell Amoco Cap Rouge F-52	47°11'20.29" 61°08'15.32"	Sedco H	73-06-08 73-09-03	102 (31.1) 186 (56.7)	16,182 (4932.3) P&A
Mobil-Tetco Sable Island 5-H-58	43°57'27.20" 60°57'37.80"	Bawden Rig 9	73-08-15 73-09-18	34.8 (10.6) KB 5.9 (1.8) GL	8,130 (2478) P&A
Mobil-Tetco Sable Island 6-H-58	43°57'27.20" 60°07'37.80"	Bawden Rig 9	73-09-22 73-10-18	34.8 (10.6) KB 5.9 (1.8) GL	7,727 (2355.2) P&A
Union et al Shell Ojibwa E-07	43°46'20.44" 61°46'14.42"	Sedco H	74-02-04 74-02-28	98.1 (29.9) 248 (75.6)	7,643 (2329.6 P&A

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS	
Mobil-Tetco-Texaco Citnalta I-59	44°08'42.58" 59°37'32.11"	Sedco J	74-02-04 74-04-29	98.1 (29.9) 310 (94.5)	15,010 (4575) P&A	
Shell Demascota G-32	43°41'27.20" 60°49'54.00"	Sedco H	74-03-01 74-05-20	98.1 (29.9) 178.1 (54.3)	15,329 (4672.3) P&A	
Texaco-Shell Intrepid L-80	43°49'35.78" 59°56'43.82"	Sedco J	74-05-18 74-08-15	103 (31.4) 143 (43.6)	13,655 (4162) P&A	
Union et al Sambro I-29	43°38'35.04" 62°48'17.04"	Sedco H	74-05-23 74-06-27	98.1 (29.9) 634.8 (193.5)	10,071 (3069.6) P&A	
Union et al Jason C-20	45°29'05.45" 58°32'28.27"	Sedco H	74-07-03 74-07-22	98.1 (29.9) 370.1 (112.8)	8,146 (2482.9) P&A	
Union et al Hercules G-15	45°34'20.65" 58°47'13.06"	Sedco H	74-07-23 74-08-01	98.1 (29.9) 379.9 (115.8)	3,547 (1081.1) P&A	
Murphy et al North Sydney P-05	46°34'46.24" 59°45'01.65"	Sedco H	74-08-10 74-09-07	98.1 (29.9) 206 (62.8)	5,449 (1,660.9) P&A	
Union et al Montagnais I-94	42°53'40.71" 64°13'46.51"	Sedco H	74-09-12 74-09-29	98.1 (29.9) 370.1 (112.8)	5,400 (1645.9) P&A	
Mobil-Tetco-Gulf Adventure F-80	45°19'27.54" 57°56'22.80"	Sedco J	75-01-13 75-02-22	98.1 (29.9) 324.1 (98.9)	6,559 (1999.2) P&A	
Mobil-Texaco Sachem D-76	44°35'09.22" 57°41'58.29"	Sedco J	75-05-17 75-07-30	98.1 (29.9) 191.9 (58.5)	16,006 (4878.6) P&A	
Shell Onondaga B-96	43°45'08.23" 60°14'09.63"	Sedco H	76-01-12 76-03-21	98.1 (29.9) 198.2 (60.4)	12,328 (3757.6) P&A	
Petro-Canada Shell Mic Mac D-89	44°38'08.86" 59°28'18.93"	Sedco H	76-03-26 76-05-04	98.1 (29.9) 279.9 (85.3)	10,552 (3216.4) P&A	
Petro Canada Mobil Hesper I-52	44°41'40.33" 57°52'32.24"	Sedco H	76-05-08 76-06-05	98.1 (29.9) 138.1 (42.1)	9,200 (2804.2) P&A	
Shell et al North Sydney F-24	46°33'23.12" 59°48'45.47"	Sedco H	76-06-09 76-06-14	98.1 (29.9) 195.9 (59.7)	5,600 (1706.8) P&A	
Petro Canada-Shell Penobscot L-30	44°09'43.55" 60°04'09.33"	Sedco H	76-07-18 76-09-23	98.1 (29.9) 451.1 (137.5)	14,000 (4267.2) P&A	
Petro-Canada-Shell Wenonah J-75	43°34'34.43" 60°26'13.72"	Sedco H	76-09-26 76-11-15	98.1 (29.9) 218.8 (66.7)	12,040 (3669.8) P&A	
Petro-Canada-Shell Moheida P-15	43°04'56.31" 62°16'44.32"	Sedco H	76-11-18 77-02-15	98.1 (29.9) 367.1 (111.9)	14,100 (4297.7) P&A	
Shell-Petro-Canada Penobscot B-41	44°10'02.44" 60°06'34.50"	Sedco H	77-02-18 77-03-30	98.1 (29.9) 386.8 (117.9)	11,300 (3444.2) P&A	
Mobil-Tetco-PEX Migrant N-20	43°59'56.24" 60°17'18.23"	Gulftide	77-07-29 78-01-23	85.6 (26.1) 44.9 (13.7)	15,317 (4668.7) P&A	
Mobil-Tetco-PEX Thebaud I-94	45°53'43.67" 60°13'38.13"	Gulftide	78-02-26 78-07-03	98.1 (29.9) 91.9 (28)	13,000 (3962.3) P&A	
Chevron-PEX Shell Acadia K-62	42°51'42.54" 61°55'00.21"	Ben Ocean Lancer	78-04-11 78-08-02	42 (12.8) 2841.9 (866.2)	17,343 (5286.1) P&A	
Mobil-Tetco-PEX Cohasset P-42	43°51'48.23" 60°36'16.62"	Gulftide	78-06-09 78-07-10	100.1 (30.5) 111.9 (34.1)	8,500 (2590.8) P&A	
Mobil-Tetco-PEX Cohasset L-97	43°56-37.19" 60°29'58.55"	Gulftide	78-07-13 78-11-13	100.1 (30.5) 70.9 (21.6)	15,984 (4871.9) P&A	
Mobil-Texaco-PEX Venture D-23	44002'15.00" 59°34'21.00"	Gulftide	78-11-28 79-06-16	104 (31.7) 65.9 (20.1)	16,224 (4945) P&S	
Mobil et al Venture B-13	44°02'11.61" 59°32'03.54"	Rowan Juneau	80-08-17 81-06-06	110.9 (33.8) 81 (24.7)	17,100 (5212) P&S	
Mobil et al Venture B-43	44°01'45.01" 59°37'21.03"	Rowan Juneau	81-07-06 82-04-25	110.9 (33.8) 66.9 (20.4)	19,265 (5872) P&S	
Petro-Canada et al Banquereau C-21	44°10'07.52" 58°34'00.24"	Bow Drill 1	81-12-02 82-08-01	88.6 (27) 272.3 (83)	16,375 (4991) P&S	
Mobil et al Olympia A-12	44°01'03.27" 59°46'44.09"	Zapata Scotian	82-04-23 83-01-10	125 (38.1) 130.9 (39.9)	19,895 (6064) P&S	
Mobil et al South Venture 0-59	43°58'52.83" 59°38'08.49"	Rowan Juneau	82-04-29 83-01-02	116.1 (35.4) 80-1 (24.4)	20,262 (6176) P&S	
Petro-Canada et al Banquereau I-13	44°12'33.16" 58°31'49.38"	Bow Drill 1	82-08-02 82-12-27	88.6 (27.0) 319.2 (97.3)	17,021 (5188) P&A	

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS
Petro-Canada et al West Esperanto B-78	44°47'03.40" 58°26'11.22"	SDS Vinland	82-08-22 83-05-05	76.4 (23.3) 298.9 (91.1)	18,711 (5703) P&A
Shell et al Shubenacadie H-100	42°49'28.43" 61°28'42.81"	Sedco 709	82-11-05 83-02-12	79.1 (24.1) 4,839.2 (1475)	13,780 (4200) P&A
Mobil et al Bluenose 2G-47	44°06'22.30" 59°21'23.05"	John Shaw	82-12-30 83-09-05	80.1 (24.4) 279.9 (85.3)	19,019 (5797) P&A
Mobil et al Venture B-52	44°01'12.88" 59°38'07.76"	Rowan Juneau	83-01-19 83-10-27	111.5 (34) 65 (19.5)	19,554 (5960) P&A
Mobil et al Arcadia J-16	44°05'43.58" 59°31'58.19"	Zapata Scotian	83-01-27 83-07-19	125 (38.1) 182.1 (55.5)	19,701 (6005) P&S
Petro-Canada et al S.W. Banquereau F-34	44°03'15.63" 58°50'21.60"	Bow Drill 1	83-02-20 83-08-30	81.7 (24.9) 373 (113.7)	20,699 (6309) P&A
Shell Petro-Can et al Glenelg J-48	43°37'39.00" 60°06'25.44"	Sedco 709	83-02-22 83-11-07	78.7 (24) 274.6 (83.7)	16,890 (5148) P&A
Shell-Petro-Can et al Uniacke G-72	44°11'29.17" 59°41'09.75"	SDS Vinland	85-05-09 84-04-04	77.1 (23.5) 501.6 (152.9)	18,816 (5735) P&A
Mobil et al Venture H-22	44°01'24.10" 59°33'06.10"	Zapata Scotian	83-07-26 84-04-16	125 (38.1) 78.7 (24)	19,501 (5944) P&S
Husky/Bow Valley et al Glooscap C-63	43°12'09.85" 62°09'56.75"	Bow Drill 2	83-08-07 84-01-03	75.1 (22.9) 324.8 (99)	14,902 (4542) P&A
Petro-Canada et al St. Paul P-91	47°10'57.88" 60°13'36.83"	Bow Drill 1	83-09-02 83-12-31	81.7 (24.9) 570.5 (173.9)	9,465 (2885) P&A
Home et al Louisburg J-47	44°26'43.08" 58°21'26.02"	Glomar Labrador 1	83-11-25 84-10-13	125.3 (38.2) 207 (63.1)	19,826 (6043) P&A
Shell-Petro-Can et al Alma F-67	43°36'18.49" 60°39'56.49"	Sedco 709	83-12-02 84-07-05	78.7 (24) 155.7 (68)	16,581 (5054) P&S
Husky/Bow Valley Chebucto K-90	43°39'44.74" 59°42'52.05"	Bow Drill 2	84-01-06 84-08-02	74.8 (22.8) 357.6 (109)	17,175 (5235) P&A
Husky/Bow Valley et al South Griffin J-13	44°22'39.89" 58°01'55.20"	Rowan Gorilla 1	84-01-08 84-08-20	129.9 (39.6) 208 (63.4)	19,393 (5911) P&A
Petro-Canada et al Bonnet P-23	42°22'48.64" 65°03'01.89"	Bow Drill 1	84-01-14 84-04-04	82 (25) 438 (133.5)	14,226 (4336) P&A
Husky/Bow Valley Evangeline H-98 (Re-entered Well)	43°17'26.85" 60°58'50.60"	Bow Drill 3 Bow Drill 2	84-03-27 84-06-16 84-08-08 84-11-01	70.9 (21.6) 570.9 (174) 73.8 (22.5) 570.9 (174)	11,040 (3365) 16,549 (5044) P&A
Shell-Petro-Can et al South Desbarres O-76	44°05'56.07" 59°58'58.02"	SDS Vinland	84-04-17 84-10-13	77.8 (23.7) 226.4 (69)	19,813 (6039) P&A
Petro-Can et al Dover A-43	44°22'09.02" 60°05'09.28"	Bow Drill 1	84-04-17 84-07-10	82 (25) 380.6 (116)	14,846 (4525) P&A
Mobil et al West Venture N-91	44°00'45.82" 59°44'27.33"	Zapata Scotian	84-04-19 85-07-07	128.9 (39.3) 125 (38.1)	18,199 (5547) P&A
Mobil et al West Venture C-62	44°01'02.78" 59°40'00.25"	Rowan Juneau	84-05-19 85-03-23	110.9 (33.8) 54.1 (16.5)	18,117 (5522) P&A
Shell PCI et al Glenelg E-58 and E-58A*	43°37'17.20" 60°08'55.10"	Sedco 709	84-07-07 84-10-20	787 (24) 259.2 (79)	13,753 (4192) P&A
Bow Valley/Husky et al Hesper P-52	44°41'50.95" 57°52'47.72"	Rowan Gorilla 1	84-08-22 85-05-01	132.9 (40.5) 146 (44.5)	15,632 (5679) P & A
Mobil et al West Venture B-92	44°01'08.51" 59°43'59.68"	Glomar Labrador 1	84-10-24 84-12-13	121.4 (37) 137.8 (42)	2,369 (722) P&A
Shell Petro-Can et al Glenelg H-38	43°37'19.33" 60°04'48.61"	Sedco 709	84-10-26 85-01-26	79.1 (24.1) 293 (89.3)	15,961 (4865) P&A
Petro-Can Texaco et al Albatross B-13	42°41'10.67" 63°02'11.83"	Sedco 710	84-12-12 85-03-28	78.7 (24) 4,399.6 (1341)	13,274 (4046) P&A
Home Oil et al Citadel H-52	44°11'25.07" 58°52'39.87"	Glomar Labrador 1	84-12-18 85-05-31	125.7 (38.3) 214.2 (65.3)	18,589 (5666) P&A
Mobil et al Venture N-01	44°00'58.80 59°45'51.69"	Rowan Gorilla	85-01-20 85-06-30	12.5 (38.1) 131.6 (40.1)	11,916 (3632) P&A
Shell PCI et al Alma K-85	43°34'44.6" 60°43'01.7"	Sedco 709	85-01-29 85-04-10	78.7 (24) 223.1 (68)	11,818 (3602) P&A

WELL NAME	LATITUDE LONGITUDE	DRILLING UNIT	SPUD DATE RIG RELEASE	RT ELEVATION WATER DEPTH FEET (M)	TOTAL DEPTH IN FEET (M) (RT) WELL STATUS
Mobil et al Thebaud I-93	43°52-44.4" 60°13'50.9"	Rowan Juneau	85-03-27 85-09-30	121.4 (37) 102 (31)	16,949 (5166) P&A
Petro-Can et al Shelburne G-29	42°38'26.87" 63°33'33.46"	Sedco 710	85-03-31 85-04-06	82 (25) 3,684.4 (1123)	13,140 (4005) P&A
Shell PCI et al Peskowesk A-99	44°28'13.84" 58°58'40.98"	Sedco 706	84-04-22 85-06-13	90.2 (27.5) 203.4 (62)	13,202 (4024) P&A
Shell PCI et al Kegeshook G-67	44°06'32.69" 60°24'34.09"	Glomar Labrador 1	85-06-11 85-07-30	787 (24) 203.4 (62)	11,614 (3540) P&A
Shell PCI et al Merigomish C-52	43°31'02.65" 67°38'33.76"	Sedco 706	85-06-15 85-08-12	90.2 (27.5) 246.1 (75)	12,959 (3950) P&A
Mobil et al West Olympia O-51	44°00'47.48" 59°53'03.92"	Rowan Gorilla 1	85-06-23 85-11-09	124.6 (38) 127.9 (39)	15,800 (4816) P&A
Shell PCI et al North Triumph G-43	43°42'19.06" 59°51'22.02"	Sedco 709	85-09-26 86-02-01	78.7 (24.0) 241.5 (73.6)	14,777 (4504) P&A
Petro-Canada et al Cohasset A-52	43°51'08.07" 60°37-43.38"	Rowan Gorilla 1	85-12-20 86-03-27	131.2 (40.0) 118.1 (36.0)	9,340 (2847) P&S
Shell PCI et al North Triumph B-52	43°41'02.44" 59°52'57.04"	John Shaw	86-01-24 86-03-29	72.2 (22) 272.3 (83)	12,992 (3960) P&A Shell
PCI et al Tantallon M-41	43°50'55.99" 58°22'24.38"	Sedco 709	86-02-15 86-04-18	78.7 (24) 4,974 (1516)	18,379 (5602) P&A
Mobil et al Thebaud C-74	43°53'05.34" 60°11'35.62"	Rowan Gorilla 1	86-03-29 86-09-26	118 (36) 97 (30)	16,896 (5150) P&A
Husky/Bow Valley et al West Chebucto K-20	43°39'44.60" 50°47'32.40"	Bow Drill 2	86-04-05 86-08-11	74.8 (22.8) 307.1 (93.6)	17,614 (5369) P&A
Shell et al Glenelg N-49	43°38'59.30" 60°07'01.88"	SDS Vinland	86-06-01 86-08-04	76.1 (23.2) 237.2 (72.3)	13,254 (4040) P&A
Shell/PCI et al Panuke B-90	43°49'12.29" 60°42'35.52"	SDS Vinland	86-08-06 86-09-24	75.4 (23) 154.1 (47)	11,236 (3425) P&A
Canterra et al Whycocomagh N-90	43°39'51" 60°28'04"	Sedco 710	87-04-02 87-05-26	79 (24.1) 205.7 (62.7)	11,597 (3535) P&A
Petro-Canada et al Como P-21	43°50'45" 60°48'17"	Rowan Gorilla 1	87-05-15 87-07-01	132 (40.2) 127 (39)	11,614 (3540) P&A
Petro-Canada et al Panuke F-99	43°48'26.8" 60°44'34.7"	Rowan Gorilla 1	87-07-02	279 (85.3) 148 (45.1)	8,225 (2507) ⊙

*deviation from original well E-58

2 DIRECTORY OF ONSHORE WELLS

WELL NAME	LATITUDE LONGITUDE	COMPANY (OPERATOR)	SPUD DATE COMPLETION DATE/ RIG RELEASE	DEPTH IN FEET (M) WELL STATUS[1]
*	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	summer, 1869 *	802 (224.5)
*	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	1869 1876	1600 (487.5)
NSDM Record #11	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	1874 *	650 (198.1)
NSDM Record #12	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	1874 *	900 (274.3)
*	46°06'22" 61°11'00"	Cape Breton Oil & Mining Co.	1875 *	1100 (335.3)
*	46°06'22" 61°11'00"	Lake Ainslie Pioneer Oil & Salt Co.	1877-05 *	*
*	46°06'22" 61°11'00"	*	autumn, 1877 *	*
NSDM Record #33	45°33'36" 62°40'00"	*	1878 *	280 (85.3)
NSDM Record #34	46°10'36" 62°47'07"	Victoria Oil Co.	1880 *	500 (152.4)
*	46°06'30" 61°07'49"	*	pre-1897 *	*
*	46°07'13" 61°08'26"	*	pre-1897 *	*
NSDM Record #52	*	*	1897 *	*
*	*	*	1898-04 *	*
*	45°04'07" 64°11'12"	*	1902 *	1300 (396.2)
NSDM Record #88	46°01'51" 61°11'48"	*	summer, 1902 *	1100 (335.3)
NSDM Record #91	45°31'18" 62°42'25"	*	1902-11-18 1903-07-10	620 (189.0)
Cheverie #1 NSDM Record #90	45°09'35" 64°09'54"	Nova Scotia Oil & Gas Co.	1903 *	1910 (582.2)
*	45°08'47" 64°08'42"	Nova Scotia Oil & Gas Co.	1903 *	1900 (579.1)
*	45°10'23" 64°09'45"	Nova Scotia Oil & Gas Co.	1903 *	1000 (304.8)
Falmouth Station #1	44°59'09" 64°10'13"	*	1911 *	1911 (582.5)
Lake Ainslie #1	46°11'03" 61°11'10"	Maritime Oil & Gas Co. Ltd.	1912 *	800 (243.8)
Lake Ainslie #2	46°11'07" 61°11'05"	Maritime Oil & Gas Co. Ltd.	1912 *	1612 (491.3)
Lake Ainslie #3	46°11'05" 61°11'06"	Maritime Oil & Gas Co. Ltd.	1912-1914 *	1120 (341.4)
Lake Ainslie #4	46°11'04" 61°10'56"	Maritime Oil & Gas Co. Ltd.	1912-1914 *	1110 (338.3)

WELL NAME	LATITUDE LONGITUDE	COMPANY (OPERATOR)	SPUD DATE COMPLETION DATE/ RIG RELEASE	DEPTH IN FEET (M) WELL STATUS[1]
Lake Ainslie #5	46°10'55" 61°11'07"	Maritime Oil & Gas Co. Ltd.	1912-1914 *	870 (265.2)
Lake Ainslie #6	46°10'55" 61°11'07"	Maritime Oil & Gas Co. Ltd.	1912-1914 *	*
*	46°09'48" 61°12'46"	Gulf Oil Co.	1926 *	900 (274.3)
NSDM Record #484 Borehole #1	46°01'35" 64°27'13"	Gulf Oil Co.	1926-06-17 1926-09-17	702 (214.0)
NSDM Record #485 Borehole #2	46°01'36" 61°27'13"	Gulf Oil Co.	1926-09-18 1927-01-10	582 (177.4)
NSDM Record #505 borehole #1	46°02'32" 61°28'03"	Gulf Oil Co.	1926-09-11 1926-09-19	76.2 (23.2)
NSDM Record #506 Borehole #2	46°02'34" 61°27'57"	Gulf Oil Co.	1926-09-22 1926-10-12	215 (65.5)
NSDM Record #524 Borehole #3	46°02'36" 61°27'57"	Gulf Oil Co.	1926-10-13 1926-10-23	110 (33.5)
NSDM Record #525 Borehole #4	46°02'36" 61°27'57"	Gulf Oil Co.	1926-10-23 1926-11-04	220 (67.1)
NSDM Record #526 Borehole #5	46°02'29" 61°27'57"	Gulf Oil Co.	1926-11-05 1926-11-12	177 (53.9)
NSDM Record #527 Borehole #6	46°02'35" 61°27'57"	Gulf Oil Co.	1926-11-13 1927-02-28	648 (197.5)
NSDM Record #528 Borehole #7	46°01'40" 61°26'46"	Gulf Oil Co.	1927-03-06 1927-03-30	600 (182.9)
NSDM Record #529 Borehole #8	42°02'39" 61°27'57"	Gulf Oil Co.	1927-04-01 1927-04-26	664 (202.4)
NSDM Record #530 Borehole #9	46°03'21" 61°20'45"	Gulf Oil Co.	1927-05-05 1927-06-10	661 (201.5)
NSDM Record #531 Borehole #1	46°24'50" 61°06'15"	Gulf Oil Co.	1927-06-11 1927-06-24	81 (24.7)
NSDM Record #532 Borehole #2	46°24'48" 61°06'15"	Gulf Oil Co.	1927-05-25 1927-08-04	712 (217.0)
NSDM Record #533 Borehole #3	46°24'46" 61°06'15"	Gulf Oil Co.	1927-08-05 1927-08-29	189 (57.6)
NSDM Record #534 Borehole #4	46°24'44" 61°06'15"	Gulf Oil Co.	1927-08-30 1927-09-14	210 (64.0)
NSDM Record #535 Borehole #5	46°25'35" 61°05'04"	Gulf Oil Co.	1927-09-15 1927-10-07	360 (109.7)
Nappan #1	45°46'05" 64°13'42"	Imperial Oil Ltd.	1927-11 1927-12	673 (205.1)
Nappan #2	45°46'27" 64°13'52"	Imperial Oil Ltd.	1927-11 1927-12	159 (48.5)
Nappan #3	45°46'18" 64°13'41"	Imperial Oil Ltd.	1927-12 1928-01	210 (54.0)
Nappan #4	45°46'51" 64°14'08"	Imperial Oil Ltd.	1928-1929 *	795 (242.3)
Nappan #5	45°47'00" 64°11'24"	Imperial Oil Ltd.	1928-1929 *	795 (242.3)
Nappan #6	45°47'00" 64°11'24"	Imperial Oil Ltd.	1928-1929 *	298 (90.8)
NSDM Record #710 Nappan #7 Borehole #1	45°47'48" 64°13'24"	Imperial Oil Ltd.	1929-09-09 1929-10-15	432 (131.7)
Nappan #8	45°47'20" 64°13'21"	Imperial Oil Ltd.	1929 *	340 (103.6)
NSDM Record #720 Nappan #9 Borehole #2	45°47'55" 64°12'14"	Imperial Oil Ltd.	1929-10-31 1929-12-02	740 (225.6)
Nappan #10	45°48'00" 64°13'21"	Imperial Oil Ltd.	1929-1930 *	316 (96.3)

WELL NAME	LATITUDE LONGITUDE	COMPANY (OPERATOR)	SPUD DATE COMPLETION DATE/ RIG RELEASE	DEPTH IN FEET (M) WELL STATUS[1]
Scotsburn No. 1	45°37'52" 63°00'13"	Imperial Oil Ltd.	1930-09-09 1931-01-03	1980 (603.5)
Amherst No. 1	45°47'12" 64°13'23"	Imperial Oil Ltd.	1931-03-09 1931-07-27	4134 (1260)
McIsaac Gas Well	46°05'42" 61°11'48"	*	1938 *	1700 (518.2)
Mac No. 1	46°01'49" 61°27'37"	Lion Oil Refining Co.	1944 *	5579 (1701)
Mary No. 1	46°02'06" 61°28'06"	Lion Oil Refining Co.	1944 *	6869 (2094)
Anthony No. 1	45°10'39" 63°43'54"	Nova Scotia Oil & Gas Co.	1944 1944/45	638 (194)
Anthony No. 2	45°10'40" 63°43'54"	Nova Scotia Oil & Gas Co.	1945 spring, 1945	870 (265.2)
Sunoco No. 1	45°47'05" 64°13'39"	Sun Oil Co. Ltd.	spring, 1945 Nov., 1945	6499 (1981)
Sunoco No. 1A	45°47'05" 64°13'39"	Sun Oil Co. Ltd.	1946-04-15 1947-09-01	11,504 (3506)
NSDM Record #1171	45°35'30" 62°30'12"	Pictou Petroleum Co.	1946-05-16 1946-07-16	645 (197)
NSDM Record #1172	45°35'25" 62°30'15"	Pictou Petroleum Co.	1946-05-16 1946-07-16	36.5 (11.1)
NSDM Record #1096	46°07'55" 60°00"18"	Sydney Petroleum Co.	1946-09-01 1946-10-24	253 (77)
NSDM Record #1097	46°08'12" 59°59'58"	Sydney Petroleum Co.	1946-09-01 1946-10-24	233 (71)
NSDM Record #1098	46°07'06" 60°01'55"	Sydney Petroleum Co.	1946-09-01 1946-10-24	81 (25)
NSDM Record #1235	45°58'29" 60°56'50"	Little Narrows Petroleum Co.	1946-11-26 1947-07-08	327 (99.7)
NSDM Record #1236	45°58'29" 60°56'50"	Little Narrows Petroleum Co.	1946-11-26 1947-07-08	1614 (492)
NSDM Record #1452	45°58'56" 60°56'45"	Little Narrows Petroleum Co.	1947-10-27 1948-04-22	2004 (610.8)
NSDM Record #1453	46°05'49" 61°14'53"	Little Narrows Petroleum Co.	1948-08-09 1948-09-30	694 (211.5)
NSDM Record #1505	45°44'17" 62°01'05"	Nova Scotia Dept. of Mines	1949-07-13 1949-09-19	712 (217)
Anthony #3	45°10'42" 63°43'54"	Nova Scotia Oil & Gas Co.	1951 1951	2588 (788.8)
Inverness #1	46°03'42" 61°23'48"	Imperial Oil Ltd.	1958-08-26 1958-09-10	510 (155.5)
Inverness #2	46°02'06" 61°22'35"	Imperial Oil Ltd.	1958-08-26 1958-09-10	260 (79.3)
Inverness #3	46°06'54" 61°11'46"	Imperial Oil Ltd.	1958-08-26 1958-09-10	480 (146.3)
Inverness #4	45°55'30" 61°27'24"	Imperial Oil Ltd.	1958-08-26 1958-09-10	470 (143.3)
Inverness #5	46°05'12" 61°09'43"	Imperial Oil Ltd.	1958-08-26 1958-09-10	100 (30.5)
Inverness #6	46°04'58" 61°09'39"	Imperial Oil Ltd.	1958-08-26 1958-09-10	170 (51.8)
Lura #1 NSDM Record #2671	45°39'42" 61°50'50"	Lura Corp. Ltd.	1958-10-04 1958-12-12	1993 (607.5)
Mabou #1	46°01'25" 61°24'03"	Imperial Oil Ltd.	1959-10-24 1959-12-31	5145 (1568.2)
Port Hood #1	46°01'55" 61°28'57"	Imperial Oil Ltd.	1960-01-16 1960-04-11	9840 (2999.2)
Pacific Fox Harbour	45°50'56" 63°30'47"	Pacific Petroleum Ltd.	1963-12-10 1964-05-04	9853 (3003.2)

WELL NAME	LATITUDE LONGITUDE	COMPANY (OPERATOR)	SPUD DATE COMPLETION DATE/ RIG RELEASE	DEPTH IN FEET (M) WELL STATUS[1]
Birch Grove #1	46°08'42" 59°56'05"	Murphy Oil Co. Ltd.	1968-02-08 1968-03-24	4408 (1343.6)
Wallace Station #1	45°46'15" 63°30'30"	Anschutz Corp.	1972-12-22 1973-08-29	14,883 (4536)
Hastings #1	45°50'35" 64°04'52"	Gulf Oil Canada Ltd.	1975-06-11 1975-08-11	9644 (2939.5)
Noel #1	45°12'45" 63°42'17"	Soquip A.C.C. et al	1975-07-18 1975-08-13	4750 (1447.8)
Bras d'or Anschutz #1	45°39'11" 61°53'01"	Bras d'or Oil Company Ltd.	1976-07-27 1976-08-14	3427 (1044.6)
Bras d'or No. 3A-78	45°52'30" 61°00'20"	Chevron Standard Ltd.	1978-07-23 *	597 (182)
Bras d'or #1	45°52'30" 61°00'20"	Chevron Standard Ltd.	1979-09-21 1979-09-30	709 (216)
Bras d'or #2	45°52'45" 61°00'05"	Chevron Standard Ltd.	1979-10-03 1979-10-15	1230.3 (375)
Malagawatch #1	45°52'05" 60°55'18"	Chevron Standard Ltd.	1979-10-31 1979-11-23	10,203 (3110)
Scotsburn #2	45°38'22" 63°00'11"	Chevron Standard Ltd.	1981-08-11 1981-11-29	8654.9 (2638)
Port Malcolm	45°34'50" 61°17'44"	Corkan Engineering of Canada Ltd.	1983-09-13 1983-10-16	3582 (1091.8)
Bear Island	45°34'22" 61°17'54"	Corkan Engineering of Canada Ltd.	1983-09-30 1984-01-11	1359 (414.2)
Loch Lomond	45°46'11" 60°35'27"	Corkan Engineering of Canada Ltd.	1983-10-28 1984-03-01	810 (246.9)
North Glen	45°50'32" 60°30'10"	Corkan Engineering of Canada Ltd.	1983-10-27 1984-03-02	4120 (1255.8)

*Data is incomplete on these wells
[1]All wells P&A

3 GLOSSARY

Argillaceous rocks . . . . . a group of sedimentary rocks, commonly consisting of clay. Includes shales, mudstones, siltstones, and marls.

Blowout . . . . . an uncontrolled entry of formation fluid(s) into a well such that the drilling fluid is displaced.

Carbonates . . . . . sedimentary rocks composed primarily of calcium carbonate (limestone) or calcium magnesium carbonate (dolomite). Petroleum reservoirs are sometimes made up of carbonate rocks.

Clastics . . . . . sedimentary rocks composed of fragments of pre-existing rocks. Sandstone is a clastic rock.

Condensates . . . . . hydrocarbons that condense to form liquids at the surface due to reduced pressure and temperature. Condensates actually exist in a gaseous state in the reservoir. These liquids may be colorless or have red, yellow, blue, or green shades. Others are indistinguishable from very light crude oils. Condensates usually include such compounds as pentanes (C_5H_{12}) and some of the heavier hydrocarbons.

Conglomerates . . . . . rocks consisting of rounded or subrounded fragments from beaches, flood plains, etc., which have become cemented together.

Crude oil . . . . . hydrocarbons produced from a well that are liquids at the surface and also are in liquid state in the reservoir. Crude oil generally varies greatly in its properties and composition.

Diapir . . . . . an irregular upfold in geological strata in which overlying rocks are pierced by a core of low density material which has been pushed up from below.

Fluvial . . . . . a term used to denote being found in or produced by a river.

Fractionation . . . . . the process of separating liquids or gases by using the differences in their boiling points.

Hydrocarbons . . . . . compounds composed of carbon and hydrogen. A great variety of hydrocarbons exist. Petroleum is a mixture of many different hydrocarbons.

Kick . . . . . a sudden rise in the pressure of the circulating drilling fluid as it meets a higher pressure in the formation being drilled.

Lacustrine . . . . . a term used to denote being found in or produced by processes in a lake.

Natural gas . . . . . refers to light hydrocarbon compounds which, at surface temperature and pressure conditions, are in a gaseous state. These typically include compounds such as methane (CH_4), ethane (C_2H_6), propane (C_3H_8), and butane (C_4H_{10}).

Onlap . . . . . progressively younger strata resting upon older strata.

Overpressure . . . . . the abnormally high pressure encountered in some subsurface formations. An example is the overpressured sandstones in the Sable Sub-basin on the Scotian Shelf.

Permeability . . . . . a measure of the ease with which fluids can flow through a porous rock; the fluid conductivity of a porous medium.

Physiography . . . . . the description of the features and phenomenon of nature.

Porosity . . . . . the amount of void space in a rock that can contain fluids. Measured as a percentage of rock volume.

Stratigraphy . . . . . the branch of geology concerned with the study of the origin, composition, distribution, and succession of rock strata (beds of rock).

Topography . . . . . the science of displaying or representing the surface features of a region, as on maps and charts.

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